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CORE Banking Transformation, a required change for Banks

From needs analysis to roadmap definition

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CORE Banking Transformation, a required change for Banks : From needs analysis to roadmap definition

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Forewords : Special thanks

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Contents

1 Introduction

Entering the digital age has forced most economic companies to rethink their way of operating drastically in order to respond to major developments and thus survive growing competition. In the financial sector, banks are no exception to this generality. Most of the large banks having developed their basic technologies and their information systems in the course of the 80s on the basis of large monolithic systems, they were not able to take into account the needs necessary for the integration of new innovative technologies appearing currently on the market. They therefore become more and more obsolete by drastically slowing down the innovation possibilities of the banks. As example, a study (amongst other) leaded by Fraefom highlights the growing obstacle of legacy systems. In fact, in this study, around half of the banks explained that their legacy systems currently represent the biggest barriers to growth and innovation for banks [E]. An update of their central system therefore becomes a necessity for most banks in order to make banks more flexible and more easily "open" to new technologies.

First, this thesis analyses the evolution of banking sector activities in our society as well as the main changes, threats and opportunities that banks must face in order to survive (economic crises and loss of consumer confidence, increase in competition via many factors such as globalization or the development of new market entrants, increase / complexification of directives and regulations applying to the sector, etc.).

Then, the analysis will focus on topics slowing the evolution of the bank facing all its obstacles and the identification of one of the major risks involved: the obsolescence of the CORE banking system (CBS). The importance linked to this risk will then be detailed through a detailed definition of the CBS, its central utility within the bank and of the danger linked with their replacement / update. Most banks, while being afraid of carrying out such a transformation, have no choice but to carry out an in-depth update / replacement of their old system to improve innovation and evolution.

Following sections of the will provide rules and best practices to determine a first roadmap for the implementation of the new CORE banking system, starting with the strategical delimitation of the project with the definition of main constraints, goals and objectives and going to a view more "operational" through requirements engineering and analysis of both business, SI and technical architectures of the bank highlighting the gap between the baseline and target situation. Once those analysis performed, the trajectory between AS-IS and TO:BE situation will be subdivided in a set of tasks that should be listed within a Work-Breakdown-Structure (WBS) that represent a first view of the work to be performed. A final section will give a short focus to dependencies management to enhance a good planning and management of the program.

Finally, a conclusion will be presented highlighting the key messages of the thesis and the definition of next steps to be performed.

2 Banks in Today society : A world of Threat and Opportunity

In today society, Banks have gained a centralized place becoming the main factors in raising the level of economic development of the world. Indeed, those companies are at the heart of the money business and in direct responsibility in the management of the financial risks present in an economic system [A]). The importance of these companies in our society is mainly explained by the power enjoyed by the institutions from banking sector as economic agents of the creation of money. Indeed, even if states have a monopoly on the creation of physical currency through central banks, commercial banks have the ability to create and manage debt. Any debt thus created amounts to a creation of money; any debt extinguished by its repayment is equivalent to a destruction of money. (ex. If someone put 100EUR in its bank account, Bank is allowed to lend around to 80EUR to another person. These 80EUR will thus arrive in another Bank account and the bank will be allowed to lend 60EUR from these 80EUR to another person, etc.). Nowadays 90% of the money supply defined as the amount of currency in circulation came from commercial banks.[B]. The economic impact of this so-called "scriptural" currency according to the mechanisms described by economic theory is strong due to two main effects linked to it

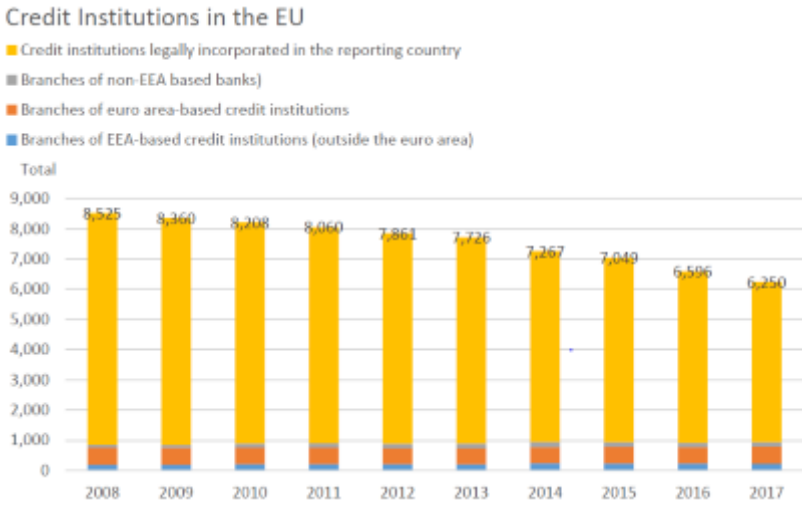
- Multiplier effect: Such a creation of money induces an injection of liquidity that will go within the economic circuit.
- Accelerating effect: in case where the credit given is used in order to invest on a specific project, it could produce a series of induced investments

Due to the high importance and the potential huge impacts that banking activities may have on a country's economy, banks are not treated as other companies and are thus subject to specific legislation governing the exercise and control of their actions. Theses companies are framed by strict laws [AX] supervising:

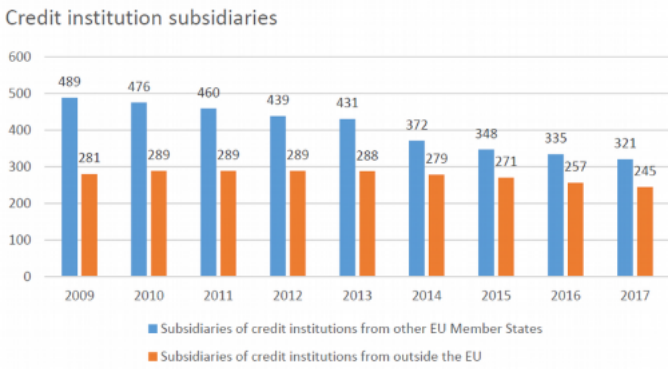
- From the point of view of their existence by obtaining an authorization to practice the banking profession;
- In terms of their activity by regulation (national law but also international regulations);
- In terms of activity controls through supervision in each country operated by a central bank, but also by other professional bodies or agencies.

However, nowadays, the financial sector (as many other sectors) is facing strong evolutions pushed, amongst other, by entry in digital revolution. Such evolutions forced banks to adapt their activities in order to survive. Impact of these changes on the banking sector is visible :

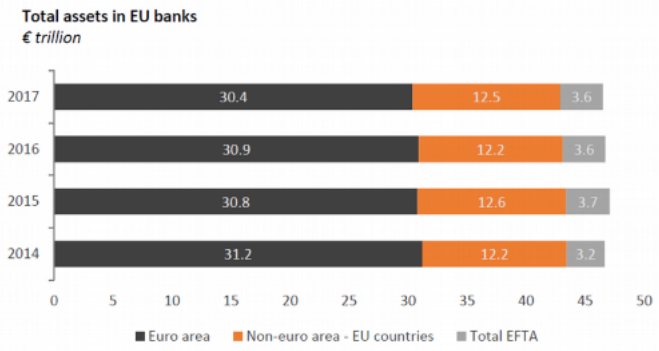
- Since 2009, number of credit institutions from European Union have drastically fallen from 8525 to 6250 in 2017. This accelerating trend includes factors such as mergers in the banking sector with a view to enhance profitability. [V]



- This fall trends is the same regarding the number of branches as it can be observed in bellow graph. Such a decrease may be explained by the increasing use of digital banking by consumers as more than half of EU individuals used internet banking in 2017 up from 29% in 2008. [V]



- However, despite the decrease trends of credit institutions described above, economic impact of the banking activity in country's economy remains high with a more or less constant amount of asset held by the EU bank (around 42 trillion of euros in 2017) [cf graph bellow]. [V]



The following parts of the chapter focuses on the main changes that have happened and are still happening in the society, their impacts on the Banking sector and how the banking sector will evolve to tackle these changes.

2.1 Historical crisis : The Numerous risks faced by Banking sectors

As other industries, Banks are facing many risks that can compromise their position and even run them to bankruptcy with huge impacts on the society. Over the past decades, they had to deal with several financial crisis affecting their activities. Obvious example of such crisis is the sub-prime crisis that occur on 2007 – 2008 that has been described as the worst since Wall Street Crash and Great Depression (1920s and 30s), if not the greatest crisis in the history of finance capitalism (Turner, 2009) and has caused catastrophic damages, estimated as a loss of 50 trillions of USD dollars (40-45 trillions of EUR) equivalent to one year of world GDP (Aisen, Franken, 2010)[W].

Customers' confidence regarding banks and their activities has obviously been highly impacted by such consequences. In average, people have become much less inclined to trust big banks, less loyal and more reluctant to accept branding and marketing from these organisations. The resulting recessionary effects have been very important and are still present nowadays.[X] Bellow is a non-exhaustive list of the main risks that banks must tackle:

- Credit Risks: It comes from the possibility of non-payments or delayed payments of loans by the borrowers/group of borrowers. Profitability of banks is extremely sensitive to its kind of risks as their incomes primarily come from issuing loans. In order to deal with such risks, banks have come up with a wide variety of measures. For instance, banks always hold a certain amount of funds in reserves to mitigate such risks. This is the most important risk for commercial banks and poor asset quality is the main reason for many bank failures. During financial crisis of 2008, this risk has been one of the main root causes starting with enormous write-downs by banks because of bad mortgages, and the first bankruptcies. [C] [D]

- Liquidity Risk: This is another kind of risk that is inherent in the banking business. Liquidity risk is the risk that the bank will not be able to meet its obligations if

the depositors come in to withdraw their money. Indeed, as previously explained only a percentage of the deposits received are held back as reserves, the rest are used to create loans. Therefore, if all the depositors of the institution come in to withdraw their money all at once, the bank would not have enough money. This situation is called a bank run and has happened countless times. [D]

- Market Risks: This risks comes from the significant portion of securities hold by banks as a means to park money for the short term. The business of banking is therefore intertwined with the business of capital markets. For instance if they are holding a large amount of equity then they are exposed to equity risk. Also, banks by definition have to hold foreign exchange exposing them to FOREX risks.

- Operational Risks: Banks have to conduct massive operations in order to be profitable. Economies of scale work in the favour of larger banks. Hence, maintaining consistent internal processes on such a large scale is an extremely difficult task. Operational risk occurs as the result of a failed business processes in the bank's day to day activities. None of the departments in a bank are immune from operational risks. Operational risks may occur if there is a breakdown of the information technology systems which make managers of banks very reluctant to modify/change these systems. As an example of such risk's consequence, Barings Bank ended up bankrupt due to operational risk and the resulting failure to implement appropriate internal controls. One trader was able to bet so much in the derivatives market that the equity of Barings Bank was wiped out and the bank simply ceased to exist. [D]

- Reputation Risk: Reputation is an extremely important intangible asset in the banking sector. Clients want their money to be deposited in locations that respect safe and healthy business practices. As a result, if any information affecting the bank's reputation is published, its activity is immediately impacted. The example of Citibank perfectly illustrates this risk. Information has been published suggesting that the bank manipulated exchange rates by making false transactions with its own trading partners. Immediately huge fines were imposed on the bank by the regulator. In addition, its reputation as a fair-trading bank was immediately tainted when customers discovered that they tended to resort to market manipulation it. Many potential customers have probably leaked this bank resulting in a loss [D]

- Systemic Risk: Financial system being one intricate and connected network lead to easy propagation of risk which is called Systemic risk. Such propagation is amplified by banks being counter-parties to each other in a huge amount of transactions. Hence the failure of a bank increases credit risk event for other banks and forces them to write off certain assets as a result of the failure of their counter-party. Such writing off may lead to bankruptcy of other banks, etc. The very nature of banking system therefore makes them prone to systemic risks which do not affect

an individual bank but the entire system. (e.g. during sub-prime crisis, it looked like the entire global financial system would collapse) [D]

- Moral Hazard: In a transaction, Moral Hazard occurs when one party has the opportunity to take additional risks that negatively affect the other party. Such a risk has been amplified over past years due to the numerous "rescues" that states have implemented to allow banks to survive. This too big to fail model has caused banks to become reckless in their pursuit of profit taking excessive risk to increase their profit and knowing that if their risk backfires, then the losses are borne by taxpayers in the form of bailouts. Although central banks are using audits to ensure that safe business practices are followed, banks nowadays indulge in risky business the moment they are not under regulatory oversight. [D] [C]

2.2 Digital revolution : An ever-changing society :

Entry into the 4.0 revolution created unprecedented competition for businesses! Indeed, the increasingly easy access to a growing number of data that are more and more accurate combined with an increasingly efficient processing of these data enabled companies to analyse their consumers in depth and to predict, at least partially, their behaviour, particularly through the development of data mining. This development of knowledge has led to an evolution of the strategic vision of companies moving from a reactive vision to a proactive vision. Previously, companies were adopting a defensive strategy by responding to internal and / or external environmental pressures, they now are attempting to anticipate future trends and regulations by trying to prevent potential hazards [Y].

Banking sector has not escape to this revolution and is fully taking part to the change to survive to increasing competition leads by the appearance of news competitors that are gaining more and more influence using Fintech. "Fintech may be understood as the use of innovative information and automation technology in financial services. New digital technologies automate a wide range of financial activities and may provide new and more cost-effective products in parts of the financial sector, ranging from lending to asset management, and from portfolio advice to the payment system". [Z] Such influence of the Fintech is gaining more and more influence: in Europe more than 2,000 startups dedicate their business to financial technology, while globally more than 7,500 startups provide valuable solutions for the industry. In addition investments for such technology are reaching €27 billion worldwide in 2017 alone which more than double the amount of a year before. [V]. "Fintech revolution" cause disruption by successfully targeting those sub-optimally served segments by delivering more suitable functionality and/or providing a solution at a lower price. Thus, using innovative business models (e.g. crowdfunding, peer-to-peer loans, alternatives regarding transfers and international payments, robo-advice, new electronic trading platforms, etc.). This new market disruption competes against non-consumption, consumers who previously lacked the money or appetite to buy and use the product. Banks are now forced to seize the opportunity to incorporate such fintech into their model as it will undeniably have beneficial effects, such as an improved

customer experience, lower transaction costs, and a wider range of services for customer segments that were previously not or under-served. [Z].

To do so, investments in technology have significantly grown to become 15–20% of the wholesale banking cost base. Indeed, 62% of global banks expect to be digitally mature by end of 2020, compared with just 19% in 2018. Such an evolution is also highlighted by the development of APIs available for third party to connect that has gone from 17 in 2007 to 1,500 ten years later [V]. In this evolving sector, the biggest weakness banks when assessing their capabilities to innovate and digitise, is their legacy IT systems, that constrain change enablement. (according to the results of the fintech survey conducted by the National Bank of Belgium (NBB) in 2017-2018)[Z]. While development of Fintech may bring many opportunities to banks, it also comes with many risks and issues. Indeed, as previously explained, due to digitalization, the physical appearance of banks is and will continue to be subject to change and with it the complete business model of these companies. Concrete examples of this include on-boarding of client. Goode Intelligence states that by the end of 2020, some €1.9 billion bank customers around the world will be using biometrics and e-identification to access financial services. Such evolution will be driven by mobile bank adoption and the development of online financial services. Banks thus do fear to lose the (physical) customer relationship they have that used to be of the main factors behind the trust of their customers. In addition the selection of the right fintech in which banks should invest also represent a huge strategical risk due to the abundance of fintech solutions and the absence of guarantee that it will be picked up by the market.[Z]

In addition to "Fintechs revolution", entry into the 4.0 revolution has lead to the "data revolution" lead by the increasingly easy access to a growing number of data that are more and more accurate combined with an increasingly efficient processing of these data. Nowadays, Banks are flooded by data mining techniques (i.e. techniques that permit the extraction of (hidden) information/knowledge from large Database analysis) due to several reasons such as the development of communication technologies, informations treatment, expected accrued quality by customers, increase in competition leads by new entrants within the market (foreign banks, network banks, large retailers and insurance companies that are developing banking activity through partnership with traditional banks), international economical pressure to increase banks' productivity and efficiency and the development of risk model due to the reform of solvency ration.

Explosion of the number of data has also lead to the so-called big data analysis. In several countries, bank are increasingly analysing data from social network to improve analysis of the borrower (they ask to access to the customers account to collect data and analyse them). Bank are also using more and more sophisticated techniques to detect fraudulent behaviour by analysing variate date such as geolocation, behaviour of customers on internet, navigation historic, etc.

In addition, big data is used for a while in order to forecast the price of financial instruments. Such type of analysis has gained in popularity since the discovery in 2003 of the correlation of specific key word used within google research and the evolution of stock prices (before a fall of the stock indexes, investors are more aimed at searching information to decide whether they should keep or sale their assets. It is easy to imagine the possibility offered by such kind of discoveries for the financial market. Banks are thus more and more pushed to invest in data analysis technologies in order to be the first to enjoy variation of the financial market. [AK). This explains the leader place occupied by banking industry in the development big data and business analytics solutions, in which revenues will surpass €180 billion by 2020. [V] Banks are investing huge amount of money on artificial intelligence (AI), robo-advice, cloud computing, etc. Such investment is boosted by the expectation of high net gain as shown by studies highlighting that 67% of executives expect AI to result in a net gain in jobs within their bank in the coming three years and that between 2018 and 2022, financial services companies that invest in AI and human-machine collaboration could boost their revenue by an average of 32%.[V]

2.3 Globalization of the banking sector:

Globalization corresponds to the free movement of goods, capital, services, people, technology and information. It results in particular from the liberalization of trade, the development of means of transport, and the development of information and communication technologies on a planetary scale. In recent decades, the society has experienced a rapid increase in this process of globalization also boosted by different causes:

- Technology development [e.g. the entry into the digital era allows the establishment of remote service delivery, etc.]
- Implementation of regulations governing the opening of international markets [e.g. European Union, CETA, etc.])

Globalization of society on a planetary scale has mainly manifested itself in:

- Significant intensification of competition
- Significant increase in human interaction
- Growing interdependence of economies

The financial sector, like other areas, has not escaped this process. Indeed, the continuous development of information technology has contributed to the internationalization of the money and capital markets, the development of new risk management techniques and the arrival of a series of new complex financial products. Furthermore, and as for the other sectors, the internationalization of banks has been pushed by a set of standards aimed at promoting the liberalization and harmonization of the sector (eg creation of the European monetary union and European banking coordination directive, repeal of the Glass-Steagall law in the United States, etc.) [AV]. In the context of the globalization of the financial sector, banks must therefore know how to seize opportunities while facing the associated challenges in order to survive :

Intensified competition As in other areas, competition between banks has increased in recent decades, particularly cross-border competition forcing banks to improve their efficiency in order to retain customers and avoid being kicked out of the market. In the banking sector, competition has mainly increased through the growing presence of foreign banks in a country. In order to continue to survive in this society, banks are therefore urged to reduce their costs as much as possible while trying to increase their profits by offering innovative products / services likely to please consumers. If this competition is not properly regulated this can push banks to invest a lot of money in risky products (having de facto promises of income higher) which can lead to disastrous consequences like those encountered during the great crisis of 2008.

Increased exchanges and human interaction The increase in exchanges and interaction impacts banks in two main ways: First of all, and linked to the increasing evolution of competition in the sector, through the increased migration of customers leaving their banks for the benefit of another. Indeed, one of the characteristics of globalization is the decrease in the number of barriers which previously restricted these flows. Consumers are today much more free than before to choose their bank according to the criteria they consider important (innovative, cheaper, responsible, etc.). On the other hand, customers are much less loyal to financial companies than they were before. Banks therefore have to deal with constant exchanges and must be able to keep their services up to date and functional according to current trends. Then indirectly via the increase in financial transactions. Indeed, globalization has had a considerable impact on the number of transactions recorded. Indeed, recorded household consumption has increased, on average, since the 1970s by +/- 2% per year. This increase in consumption therefore translates into an increase in the number of financial flows to be managed by banks [AW]. These must therefore have robust systems to guarantee the proper functioning of these transactions and despite their diversity (international National Vs, currency differences, cash withdrawal Vs payment by checks Vs payment by card Vs mobile payment, etc.)

Growing interdependence of economies The financial sector, perhaps more than other economic sectors, is governed by a complex set of inter-dependencies. As banks are often creditors and debtors of each other, the risks incurred by one may therefore have significant repercussions on the others. Indeed, if for one reason or another, a bank cannot repay its credit (e.g. bankrupt or other risks) its lenders may also lack of liquidity. The resulting globalization and internationalization of banks has clearly increased these dependencies and added market risks to other risks. Indeed, if a state finds itself in a dramatic situation following an economic crisis (eg real estate crisis in the United States, debt crisis in Greece, etc.), the repercussions will be transmitted from banks to banks and this in an international way. In order to minimize this kind of risk as much as possible, the states are putting in place a large number of directives and regulations governing this market, both nationally and internationally. A focus on these will be discussed in final section.

2.4 Evolution of the directives / regulations :

As explained earlier, banks have immense influence on society as it stands today. The various risks to which they are exposed can de facto have disastrous consequences on the economies of different countries and worldwide. In order to prevent such consequences, they are subject to much stricter regulations than all other types of business, both nationally and internationally [AX]. The internationalization of banks as well as the development and extension of the services offered has forced states to change their regulations, making them increasingly complex. Indeed, as developed in the previous section, the financial sector, like the rest of businesses, has been driven by globalization and markets and institutions have now become global. The main banks now operate in dozens of countries and are therefore subject to the supervision of dozens of regulatory agencies. To respond to this observation, groups of states have agreed on international regulations in addition to the national regulations already in force. It has therefore become a very important challenge, both for banks and for states to ensure the correct implementation of regulations and their developments. The challenge for banks to remain compliant with regard to these regulations / directives can be explained by two main factors:

1. The large and growing number of laws / regulations to which they are subject
2. The constant evolution of these laws, regulations

We can obviously quote, for most of the banks of the European Union, the Bales agreements which have for main objective to reinforce the financial stability of the sector. The most recent, the Bales III reform, was negotiated under the impetus of the Financial Stability Board and the G20 following the financial crisis of 2007. These new agreements provide in particular for a strengthening of the level and quality of equity and management increased their liquidity risk. These rules have been transposed into European Community law by means of a directive called CRD 4 (Capital Requirements Directive 4). [AY] But banks are also subject to many other regulations aimed at regulating all of their activities in order to best protect consumers. To name just a few of the regulations in question to which banks may be subject:

PSD2 (Payment Services Directives 2) It pursues the objective of establishing a legal framework for simpler, more secure and more efficient payments within Europe. [AZ] Concretely, this implies two main consequences:

1. "Banks and independent payment providers are obligated to "open up" their data and payment initiation capabilities to third-party providers as and when an account holder consents to their doing so"[BA]
2. Banks are forced to improve their security measures to protect consumers data and their financial assets in this more connected ecosystem where sensitive data is shared with many more entities than before. Implementation of strong customer authentication (SCA) is thus required, which means that payment services providers use several independent authentication methods to check the legitimacy of transactions. [BA]

MCD / CCD [Mortgage Credit Directives / Consumers Credit Directive] both MCD and CCD requires creditors to give excessively detailed information to the consumer prior to entering a consumer credit agreement. It aims at improving transparency so that it is easier for individuals to compare credit products and make a well-informed decision about whether or not the credit on offer suits their needs and financial circumstances. Bank should thus follow the potential evolution of such regulation and adapt processes of providing credit to remain compliant [BC]

GDPR (Global Data Protection Regulation) European data protection regulation which came into effect in 2018 regulate the way organizations process the personal data of EU citizens. Main goals of GDPR are the standardization at European level of data protection regulations, corporate empowerment by developing self-control and the strengthening of the right of individuals. Obviously, as many other enterprises, banks are highly involved in customer data management. GDPR have made banks' mind-set evolved. Indeed, as an example, GDPR stipulates that businesses must not keep personal data for longer than they need it, after which it should be erased or anonymised. However, retail banks used to keep personal data for long periods in case it is needed in the future. Several works thus had to be performed to review their customer records retention and disposal policies. [BF]

AML (Anti-Money Laundering) This directive aims at preventing the use of financial circuits for unlawful purposes. To remain compliant with it, banks have the obligation to :

- Apply customer due diligence measures:(e.g. identification of the customer and of the beneficial owner(s), information on the business relationship, ...)
- Scrutinize certain transactions with particular attention
- Maintain a continuous follow-up of clients relative to the risk they present
- Keep and update certain documents
- Cooperate with authorities and obligation to notify
- Incorporate a payers and payees' name or account number into transfers

Obviously banks and financial institutions in general are subject to many other regulations (EMIR, MIFID, FATCA, MAD/MAR, etc.) evolving according to their business sectors and the geographic areas in which they operate. These laws are far from being stable and are constantly evolving in order to meet the needs of the market. Banks must therefore continually adapt themself in order to meet the requirements in force and anticipate those which will have to be implemented in the future. Failure to comply with these can represent very significant costs for the institution. On the one hand, if the regulator notices, large fines can be distributed. On the other hand, the impact is also

present on the brand which will be tarnished with consumers. They will therefore be less inclined to leave their finances in the bank, which will result in a shortfall

2.5 Others external sources of changes :

Bellow are some examples of other external factors impacting banking sector

Brexit impacts on banking industry Following the result of the referendum of June 23, 2016, the United Kingdom decided unilaterally to leave the European Union. This withdrawal is and will continue to cause "substantial structural change in the EU's financial architecture" in the coming years. As dependence on British financial companies is particularly present in the clearing of derivatives, the activities of investment banks and the trading of securities and derivatives these areas are therefore likely to be particularly impacted by Brexit.[BG] Assessing the precise overall impact of Brexit on the future financial architecture of the EU remains very complicated to analyze as it is dependent on many factors which are often not yet determined and which are likely to change. For example, the evolution of the UK regulatory and supervisory frameworks is one of these factors, as misalignment with the EU may jeopardize the provision of services outside London (in order to limit the possibilities of 'regulatory arbitration). Another factor to take into account to assess the magnitude of the impact concerns the estimation of efficiency costs for activities subject to economies of scale. Furthermore, many banking activities, such as deposits and loans, do not have an EU equivalence regime and the provision of continuous cross-border services is not an option. To compensate for this, some banks based in the UK are establishing / extending their presence in the Euro zone, strongly impacting the banking landscape. When their target operating models are reached, these banks plan to transfer more than 1.2 trillion EUR in assets to their eurozone entities. [BG]

COVID-19 impacts on banking industry The COVID-19 pandemic is probably the most serious impact of the financial sector in almost a century. Borrowers and businesses face job losses, slowing sales and declining profits as the virus spreads worldwide. Banking customers may seek financial relief and banks are encouraged to help them. At the same time, the latter find themselves having to invest massive means in order to keep their distribution channels open, despite the advice of social distancing and the functions of supervision and compliance which were never designed for remote work. In addition, banks must be prepared because the market and customer behaviour may potentially change as a result of this crisis. Indeed, customers are becoming increasingly reluctant to spend time in crowded public spaces and are increasingly turning to remote solutions to perform the majority of their operations. [BH] [BI]

3 Core Banking System transformation: an unavoidable step for bank to evolve

3.1 Legacy Banking system: Blocking point in the path to evolution

In order to survive to the fourth industrial revolution, banks are forced to evolve, diversify their activity, update their technologies while adapting their system to be compliant with applicable directives/regulations and with the one that are expected to come. However legacy system of banks are becoming more and more an obstacle to these evolution as stated by a research performed by Fraefom. This study states that almost half (46%) of bankers perceive legacy systems to be the biggest barriers to the growth of commercial banks. [E]

Legacy systems indeed are very complex which make change and evolution very difficult. Often, these systems have been built on monolithic architecture, so any change a bank needs to make is frightening with a great deal of impact assessment needed to ensure a change to one system does not impact all of the others. Banks are struggling with legacy systems. Such an issue is explained by the fact that Legacy systems of big banks were mainly produced in the 70s and 80s and thus were not designed for a digital age and the evolution that goes with it. During the 70s and 80s banks were masters of tech innovation (creation of ATMs, BACS and international card payments and many other innovation). Many of the core systems that run the finance sector today are the same ones that were built in that innovation wave and are mainly mainframe-based product-oriented applications that lack flexibility and often impede the ability of IT to quickly and efficiently respond to new business requirements. "Things slowed up somewhat after that and although these systems were built to last, they weren't necessarily built to change". [F] [G].

In addition most of these systems were written primarily in COBOL which almost a dead language. It makes the finding of skills to maintain the system (and make it evolve) very difficult. Banks sometimes have to persuade many coders that have already retired, to come back into extremely lucrative part-time consultancy to keep banking systems up and running. As this skills pool continues to shrink, the maintenance of legacy systems will present an exceptional challenge. [G]

Finally many of the problems surfacing today in core systems come from application of tactical integration solutions with minimal regard for the end-to-end solution architecture. "Product-oriented core banking solutions are plagued by ongoing application fragmentation resulting in an ever-increasing maintenance burden" [F]. Example of impacts resulting of such inflexibility, in 2005, Tower Group reported that core systems account for one-half of total IT cost in bank and account for 3/4 of the total maintenance in IT. It thus limits the response to business requirements, and this in turns leads to patching to keep the solutions relevant and viable. As a result, banks are review-

ing core systems alternatives in order to reduce costs and to provide better alignment between business and IT. [F]

Such inflexibility of legacy core banking systems is more and more becoming a huge issue for banks. Thus this challenge is putting banks at a serious competitive disadvantage (while putting customer service at a risk) because they have more and more difficulties to meet challenges and to address key growth imperatives, including the following:[G] [H]

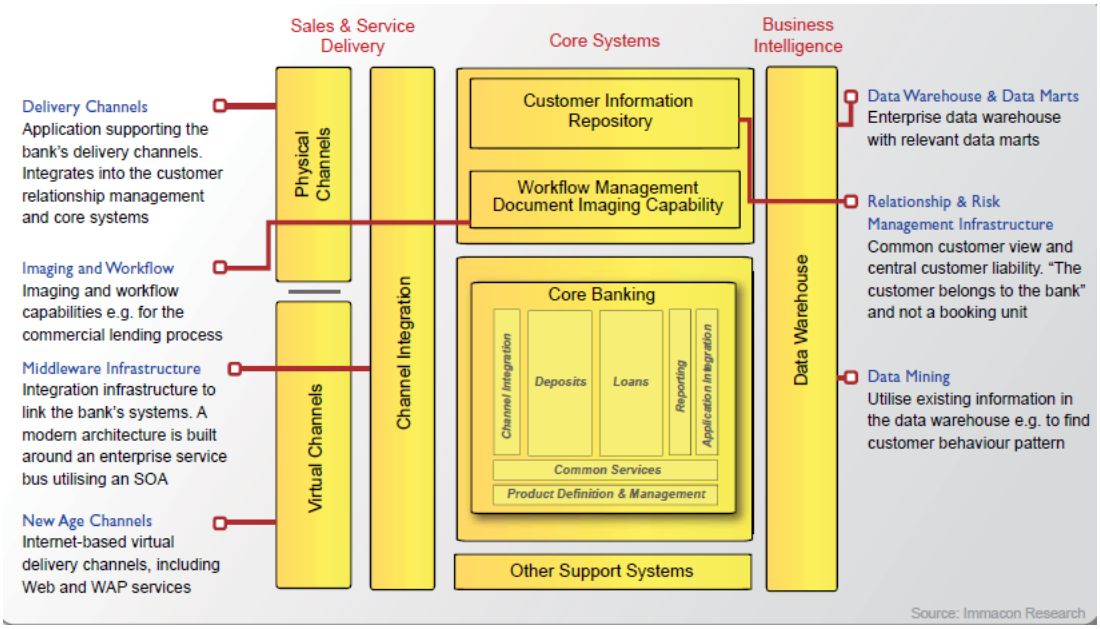
- Seize market opportunities efficiently
- Increase profitable customer acquisitions
- Develop the offer of new services and products
- Proactively and effectively solve security issues related to technological obsolescence and associated problems, loss of skills, etc.
- Maintain the banks' current activities while allowing them to grow and develop in other banking sectors, particularly through mergers and acquisitions
- Manage issues related to governance, risk management and compliance
- Enable efficient targeting of investments
- Significantly reduce the unit cost structure and minimize general operating expenses
- Increase volume without compromising risk
- Regain consumer confidence through the development of innovative, reliable and quality products and services

Legacy systems and processes thus are under pressure due to internal and external factors. Increasingly regulators pressure, competition development lead by fintech's feeding the thirst for information, self-service capabilities, fast decision making, new generation of technology evangelists, etc. with limited patience for a lack of agility are all pushing financial institutions to prioritize the focus on transformation projects. "Sooner rather than later, banks will have little choice than to invest the time, money and resources necessary to modernise their IT infrastructure if they are to compete in the digital economy." [H]

3.2 Core Banking Transformation: first step for banks in the path to survive

The Core Banking solutions (CBS) are vital to the day-to-day functioning of any bank. It is an integral part of the banking technology which aims to serve their clients and customer with the best services. CBS are gaining importance through advances in the

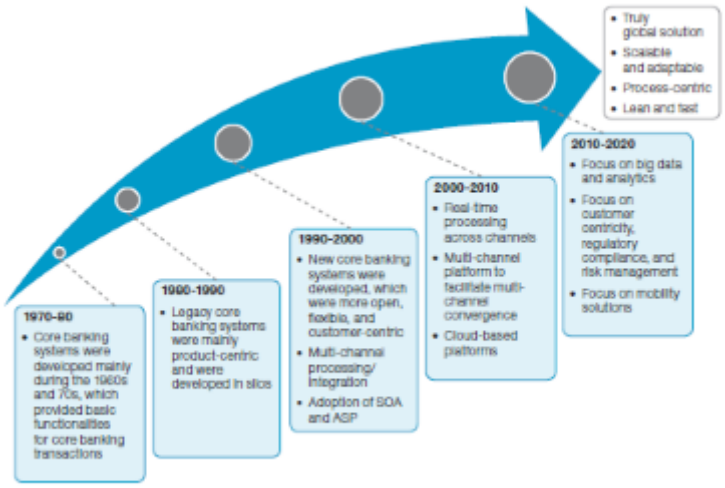
Internet and information technology that have reduced manual labor in banks and increased efficiency. Bank operations such as transaction registration, booklet maintenance, interest calculation on loans and deposits, customer registrations, balance of payments and withdrawal are performed by computer software developed for this purpose. Gartner defines a central banking system as *"a back-end system that processes daily banking transactions and records updates to accounts and other financial records. [...] Core banking systems typically include deposit processing capabilities, loans and credits, with interfaces with general ledger systems and reporting tools "*. CORE is the acronym of "Centralized Online Real-time Exchange" which means that Core Banking System are centralized systems (or network) within a bank and its branches allowing bank's customers to access, manage and perform basic transactions from any branch of the bank they hold an account in. In addition CBS enable to perform mission critical operations for banks related to accounts, loans, payments, and securities. Banking core systems drive revenue generating operations, such as account management, deposits, loans, credit cards, etc. [F] Thus it represents the heart and backbone of the bank's information technology (IT) infrastructure. [H][F] CBS thus remain a back-end system and does not deal with the customer-facing front end of the bank neither with analytic embedded in data warehouse design. [BK] *"In simple words, core banking is a bank automation process that aims to provide impeccable means of book-keeping, enhanced customer services and ease the decision-making process. When all of these fundamental goals are achieved, it eventually leads to increased efficiency, customer satisfaction, and profitability."*[G][AG]. Picture bellow provide an overview of typical banking architecture (showing the emplacement of key components) [BK] :



Core Banking should thus be implemented in a way that is aligned with strategical position of the bank. Such position has evolved from the years 70s-80s (as seen in bellow

picture[AG]) with a product-centric position where CBS were mainly implemented in silos to support basic activities to nowadays with a client-centric vision and a focus on multi-channel processing, big data analysis, mobility solution, real-time processing, etc.

Exhibit 1: Evolution of Core Banking Systems



Source: Capgemini Analysis, 2013; "Core Banking Systems Survey", Capgemini, 2008

When well implemented such system offers many benefits to the bank. Amongst other:

- Reduce overall costs related to IT maintenance
- Facilitates the automation of certain tasks that also reduces operational costs and improve overall employee productivity while reducing the risk of human error. [AH]
- Consolidation of data/information avoiding "multiple versions of truths" and providing quick and easy access to information and processing, thus facilitating rapid decision-making. Core banking software indeed allows the banks to create a centralized data center where data will be stored in proper format to allows banks to make informed decisions with the help of facts and figures. [AH]
- Facilitates the development of new core banking activities thereby improving competitiveness through faster product deployment, product innovation and differentiation [AH]
- Due to improvement in operational efficiency, such as reduced loan approval time and better straight to processing, global cost of deposits comes down [AH]
- The customer orientation of the new CBS allows to develop relationships with customers through a deeper knowledge of them and an adaptation of products / services to meet their needs "anytime and anywhere ". This orientation is intended to enhance the customer experience and loyalty [AH]

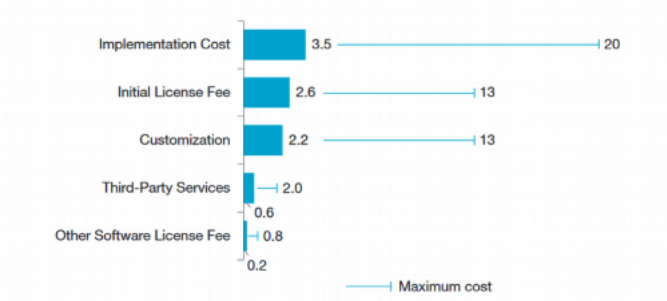
- Flexibility, in response to the complexity and lack of flexibility of legacy systems, today's CBS make a decisive contribution to a bank's ability to respond quickly to changing market conditions, including comply with current regulations (Gartner), as well as by facilitating the development of new products and services.[AH]

All these advantage leads to intangible benefits such as increase in market share and enhanced competitiveness due to reduced costs of deposits.

3.3 Implementation of Core Banking Systems : The fear of banks

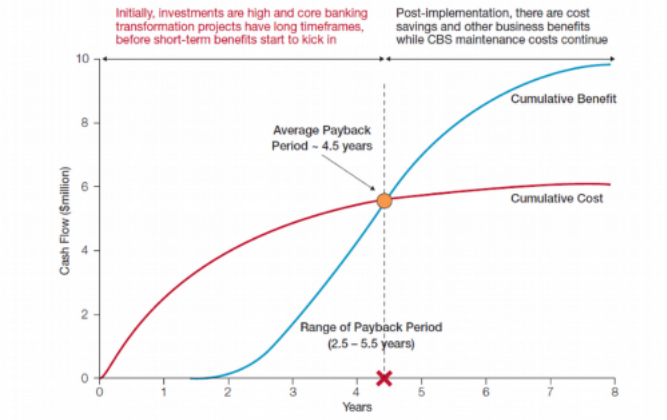
As previously explained renewal/refresh/replacement of core banking architectures is becoming unavoidable for a variety of reasons. However Core banking replacement represents the single biggest project that banks undertake in terms of cost, time to execute and associated risks. Such project are generally trickle over a period of several years and the amount invested easily represent millions of dollars (in some cases 100s of millions of dollars) spent in trying to upgrade their core banking architectures [AG). Indeed, Services from the core system vendor, such as implementation and customization costs, can often exceed the initial license fee. Over the life of a core banking system, the initial license fee comes to less than half of the total cost of ownership (TCO) while maintenance cost or recurring license fee comes to an average of about 18%. [AH]. To these costs must be added the cost of shortfall generated by the decrease in the number of projects on which the bank can advance during the implementation period of the new CBT. Indeed, this kind of projects requires a huge workload and a lot of resources will be assigned to this project (and therefore will not be able to participate in any other project). Besides, as explained previously, CBT projects are extremely complex. In order to secure the deliverable of the project, it is therefore advisable to minimize the flow of new projects to the strict necessary in order to avoid that the target solution does not have to constantly change to incorporate these new projects.

Core architecture replacement is not a flip-the-switch effort. Innovative business processes must accompany the new platform to deliver substantial efficiency gains. Best practices combined with closely-aligned staffing models are required — well before implementation — to ensure optimal return on investment. Lot of changes are required to implement the new system (changes to supporting systems, interfaces, hardware, network, etc). Trainings are also necessary to form user to the new system, etc. which can represent consequent cost (Bellow picture represent an Average Cost Breakup of Core Banking transformation) [AH]



Note 1: The plot is comprised of 29 banks belonging to Tier 1 (>USD$500mn), Tier 2 (USD$100-500mn), Tier 3 (USD$5-100mn), and Tier 4 (<USD$5mn) category, with a majority of banks belonging to Tier 3 and Tier 4 category
Note 2: The core banking systems included in the survey are TCS Bancs, Infosys Finacle, Oracle® FLEXCUBE, and Temenos T24
Source: Capgemini Analysis, 2013; Core Banking Systems Cost Benchmark, IBS Intelligence, 2012

Furthermore, banks may have a long period (years most of the time) before having benefits from the new system that overpass the costs required to implement it (due to the huge TCO). [AH]



Source: Capgemini Analysis, 2013; Core Banking Systems Cost Benchmark, IBS Intelligence, 2012
Note 1: The plot is comprised of 29 banks belonging to Tier 1 (>USD$500mn), Tier 2 (USD$100-500mn), Tier 3 (USD$5-100mn), and Tier 4 (<USD$5mn) category, with the majority of banks belonging to Tier 3 and Tier 4 category

In addition to the huge cost and time invested, average percentage of success in IT project is very low. Indeed, according to a report from the Standish Group Chaos only 29% of IT project implementations are successful, and 19 percent are considered utter failures [I]. An other study from IAG consulting states that success in 68% of technology projects is "improbable". [J] But, maybe more than the possible lost of money and time invested in the projects, what affrays manager is the possibility of unplanned issues when implementing new CBS and the associated operational risk that may compromise the reputation of the company.

All these reasons combined explained why management are quite affraid to migrate their CBS. Bret Bolin, CEO of Misys, summarizes, "The risks associated with replacing a core banking system are considerable and the cost of failure is high. It is no surprise

that banks' CEOs and CIOs will only reluctantly replace core banking systems." [AC]. According to Bart Narter "Changing a core system is a painful and difficult process [...] Ripping out and replacing a mission critical core banking system is not only very costly, but it can dramatically increase risks." [AC]. The following part will focus on the main root causes of failures of such kind of projects

3.4 Main reasons of failures of Core Banking Transformation projects

Before going deeper in the analysis of the main root causes of CBT projects failure, let's define the failure of such projects. A common definition of IT project failure is IT project *" that fails to deliver the intended output within the originally allocated cost, time schedule, or initially-approved functionality, as well as the project comfortably satisfying the stakeholders and being accepted and largely used by the end users after deployment. "*[AD] Regarding this definition, to be considered as not failed, IT projects must :

- No exceed original allocated cost-effective
- Be delivered on time
- Delivered the defined functionalities
- Satisfy the stakeholders
- Accepted and used by end-users after deployment

However, knowing the ever-changing environment in which banks evolved and the long period (several years) of CBT projects, the first two characteristics of successful implementation are almost impossible to be achieved. Such definition must be reviewed to accept that, when correctly argued, cost and time estimations as well as defined functionalities may evolved due to several reasons, without questioning the success of the project. However managers of the projects should be aware that too much changes without good reasons may compromise the project (increase of uncertainty, rise of the costs, lost of trust both from operational side and management side, etc.)

When regarding at the roots causes of failures in the implementation of Core Banking System, some patterns/trends emerge. Indeed most of the sign of projects failures are fully determined before a design is developed or a line of code is written. [AD] Amongst all the reasons explaining default in CBS Implementation the following ones are the more recurring (in basic literature or when questioning people working on such project):

- Lack of involvement / participation of key stakeholders: Due to the size of such project, Core Banking Transformation projects require the direct or indirect involvement of numerous parties called stakeholders that will contribute to the project by sharing knowledge, experience, bring supports, etc. A miss of interest from such resources is one of the biggest reasons of projects failure mainly due to a bad stakeholders' management (not involve them in process, poor communication with them, etc.)

- Unclear / misunderstood objectives and requirements: A clear definition of these is of paramount importance in order for the project to reach the expected functionality within the allotted time (as reported by many researchers). Their absence therefore pushes the project to exceed deadlines, features and costs. Lack of clarity of goals and objectives often results from weak requirements analysis at the beginning of the project (Glaser, 2004). In fact, a poor analysis of the requirements is at the origin of many of these failures, which means that the projects are condemned from the beginning. [J] [AE]

- Lack of documentation of the knowledge: such issue can have big consequences and can lead to re-work to gather the information or to decision process without the full understanding of the situation. Change in the project management team at the bank level, the SI level and the vendor level during the project lifecycle; this often results in inadequate knowledge transfer, which in turn results in requirements and key issues not being addressed properly. [AE]

- Poor planning is also one of the most important causes that can impact the success of Core Banking Transformation projects. In most cases, IT managers do not have the opportunity to focus more on planning because of time constraints imposed by management; the project therefore begins before it has been clearly defined (New Zealand Management, 2003). [AD]

- Evolution of scope, objectives and requirements: In this type of large-scale project, it is not uncommon to see these parameters evolve for a number of reasons, internal or external to the company. However, each change can have consequences on another phase of the project via a domino effect or involve a cost to undo and redo what has already been done. Frequent changes in project requirements interrupt the project and contribute to increased effort each time work resumes. In addition, excessive and unfounded changes can lead to a loss of confidence in the project, which may even lead to the project being questioned. These impacts explain why the requirement / objective / scope change must be detected as early as possible and properly managed. [AC][AD] [AF] [AD]

Following parts of this paper will thus be focused on first steps of a project and description of the following methodology: Definition of the main constraints of the project as well as its main goals. Once the main goals have been defined, the bank will set up a list of objectives, potentially conceivable, whose attainment will make it possible to get closer to the defined goal. Unlike goals, objectives are specific, measurable, and have a defined completion date. They are more specific and outline the "who, what, when, where, and how" of reaching the goals. "A goal defines the direction and destination, but the road to get there is accomplished by a series of objectives." [L]. Once first overview of the strategy is defined through objectives definition, an important step will be, for each defined objective, the description of the as-is / baseline scenario which reefer to existing structure to perform the tasks related to this objective. For example, if the objective is to automate the use of a consumer credit to customers having a bank account in the bank in question,

a step prior to the development of the target solution is to describe and document the existing processes related to the consumption of consumer credit. Such an analysis will allow us to more easily target the levers that can be used to achieve different objectives as well as the potential dependencies and risks that flow from the transformation plan. Another step will be the definition of the required functionality of the new core banking system through requirements engineering techniques. The requirements engineering is divided into main phases: requirements elicitations by defining potential requirements to achieve the defined objectives, requirement analysis and validations, and requirements documentation. Once the new functionalities have been defined, a first draft of the target solution may be designed. The gap between target solution and baseline systems gives an overview of the tasks to be achieved in order to move from legacy system into the new efficient Core Banking System. Metaphor of this strategy would be the definition of itinerary, where goal is the destination, objectives are the cardinal points indicating the directions to follow to achieve the destination, baseline/as-is situation would be the departure point and, last but not least, requirement would be the road to be used to go from the departure to the destination.

4 Constraint, Goals and Objectives definition: The main delimitation of the strategy

Implementation of a Core Banking System can easily be compared as a mathematical optimization problem which aim at finding best solution from all feasible solution. Management from the banks will thus first defined main focuses of the core banking system by defining few goals delimited by constraints (budget, feasibility, scope, time, regulatory, etc.). Once goals identified, each goals will be divided in a number of objectives achievement of which will bring the program closer to the define goals. However, generally speaking and due to defined constraints, program will not be able to focus on all the objective defined. Thus a set of objective will have to be chosen amongst all the feasible set, that will maximize the profits while minimizing costs and risks. This selection will determine what is the strategy to follow in order to achieve defined goals. It is certain that each step is subject to rework due to a lot of parameters: lack of knowledge, changing scope, evolving constraint, etc. Thus it is important to understand that this is not a one way process, once feasible objectives identified, management get a clearer vision and may refine its first definition of goals. Once clearer goals are identified, more precise objectives may be redefined, which lead to a better understanding of what is feasible to achieve the goal, etc.

All these round trips are mainly due two size factors, I.E. the field of feasibility can not be determined accurately and can therefore constantly evolve and priority is also subject to evolution and with it, the selection of the optimized set of goals, objectives, requirements. Bellows are few examples of these factors :

- First estimation of workload required to achieve a goal may be under/over-estimated which will directly impact the budgetary/time constraints and thus leading to a redefinition on the feasible domain
- Due to multiple reasons, banks may be subject to evolution of budgetary constraints (e.g. when facing crisis initially planned budget may be restricted)
- Evolution of the regulatory constraint. Bank is under the pressure of regulator for several reasons and unplanned regulation may come and have impact on the scope (as an example few years ago, an objectives could have been to use privacy information that are not any-more legal due to GDPR to predict customer behaviour or to influence it)
- New possibilities may appear: Over the past decade development of fintech has revolutionized the financial sectors including banks. Such an increase of competition has led to strong changes in the priority of the banks that have invest more and more in digitization. New revolution may arise forcing banks to re-prioritized its goals/objectives
- Change of priority may also be caused by a refinement of the benefits links to the different objective – goals – requirements (e.g. if in a first time, bank has decided

to invest same amount to develop mobile payment and online onboarding, but mobile payment appears to be much more profitable, more money can be invest in this features which may lead to a decrease of initially planned resources for the oboarding feature.)

Because of the constant uncertainty, banks should invest considerable resources to estimate/anticipate as precisely as possible change/evolution of feasible domains and their impacts on the project and to manage these changes to keep the select set of goals-requirements the best one in real time. Such work is crucial in core banking project as by investing more time to correctly defining those elements, possibility to re-do the work late is strongly reduced which become important knowing that purging an error by the beginning of construction allows rework to be done 10 to 100 times less expensively than when it's done in the last part of the process, during system test or after release [K]

4.1 Goal Definitions : Destination of the project

Goals in project management are generally defined as *"[...] general guidelines that explain what you want to achieve in your community. They are usually long-term and represent global visions [...]"*. [Define Goals and Objectives] Goals are thus high-level statements that provide the overall context for what the bank is trying to accomplish when investing in core banking transformation program. Goal should:

- Reflect the Big Picture of the program [M]
- Be Ambitious yet attainable in principle [M]
- Difficult to precisely measure achievement of the goal. [M]

Definition of project's goals may not be a very complex step in transformation program, however, when correctly done, it may be very beneficial for the success of the transformation as "Fuzzy goal will most likely lead to fuzzy results" [AM].

Regarding Core Banking System, here is a non-exhaustive list of important goals that should be achieved once the new core banking system would be deployed (depending on the size of the banks, its policy, etc. some of these goals can be removed and other may be added):

- Improve overall customer satisfaction level when using main services/products of the bank. [H]
- Improve efficiency of the bank in proceeding core activities [H]
- Facilitate informed decision processes
- Be compliant with regulator directives [H]

Goals are very important from a business perspective as stakeholders need to understand the business goals that the project is trying to contribute to, in order to commonly act in this goal achievement.[M]. Once goals have been defined, they should be prioritized. Prioritization is often subjective and will mainly depend on the bank's strategy. (If the bank's strategy on digitalisation, the focus will be on new technologies while if the bank focuses more on building strong relationship with clients, they will more invest in Customer Relationship Management modules). Main goals of a project like CBT are generally decided between stakeholders that occupies the higher places in bank's hierarchy like management of the bank (CEO, COO, etc), sponsors, etc. A good practise is to documents main goals of the projects by describing each of them (up to 10 lines are generally more than sufficient per goals)

On next parts of this section, paper will focus on identification of key project's stakeholders, definition of project's scope and assumption and on the division of the goal into several objectives that once achieve should ensure an approximation of goal achievement. For the relevancy of next part, assumption is made that prioritization of the goals has been done and that budget has been allocated to each goals. How this assumption is completed will not be discussed in this chapter and further studies should focus on it

4.2 Stakeholders Identification and management

Core Banking System Transformation involves many people and organizations (including project teams, customer, community, environment, suppliers, government,...) that have impact on the program in many way (by sharing experience, knowledge or insight to support the project, by directly or indirectly impacting change in projects' strategy, etc.). In project management, they are called stakeholders and it is therefore important to identified them before initiation of the project and create a strategy to manage them for the success of your project. [AN]. The sooner you identify them; the sooner you can start communication and involve them with your project which is important knowing that lack of involvement / participation of key stakeholders is one of the main reason of CBT failure. List of stakeholders will evolve during the whole project life cycle for many reasons (new entrant, discovery of unlisted stakeholders, etc.) thus the process of identifying and documenting stakeholders is an iterative process that will lengths during the whole project life.

According to Eskerod and Huemann (2013) and Donaldson and Preston (1995) stakeholders are "individuals or groups with legitimate interests in procedural and/or substantive aspects of corporate activity and are identified by their interests in the organization, whether the organization has any interest in them".[AN] Core Banking Systems impact almost all aspect of the bank while, as describe in previous section, banks and financial institutions have impacts on most of aspect of our society. Number of stakeholders to take into account for such project would thus be huge if banks keep this definition. A refinement of the definition is necessary, this is while the paper will focus on the identification of key stakeholders in a project as described by Alladi and Vadari (2011) : project

team, customers, organizational management, organizational employees, Government, regulatory body and technology teams [AN].

Regarding Core Banking Transformation, a non exhaustive list of stakeholders would be

- Bank's employees involved in the projects: These is maybe one of the most obvious group of stakeholders involved in the projects. However, regarding the impact on the whole bank of such project, this group should be subdivided in further group. Indeed too many people are gathered in this group with too many functionalities, goals, knowledges, etc. They cannot be managed on the same basis. Two kinds of criteria should be used to subdivide this group of stakeholders
  - Hierarchical criteria based on the responsibility owned by each person
    - Leaders of the banks (CEO / COO / etc.)
    - Leader of the transformation program (Program managers)
    - Leader of projects defined to achieved the transformation program (Projects managers)
    - Team managers
    - Team members
    - Other
  - Functionality criteria determined by the speciality, knowledge, etc. of each person.
    - Risk and regulations
    - Investments
    - Assets management
    - IT/ Data expert
    - Customer Relationship Manager
    - Testers
    - etc
- User of the banks: Obviously one of the most important stakeholders' group as one of the main focus of the CBT program is implement customer centricity vision. Bank has thus to closely impact on customer and evolution in trends:
  - Account owners
  - Investor (If bank offers investment possibility)
  - Borrowers (this could be physical people, companies, financial society, goverments, etc.)
  - Not bank's clients that use bank's services (people that withdraw money in ATM, etc.)

  - other

- Investors of the banks: Investors generally give a specific focus of such kind of project due to the high risk and the huge amount of money associated with such kind of projects. Bank thus have to keep them informed about the evolution, the change, the progress, the issues faced by the transformation

- Creditor of the bank: Mainly composed of other financial institution or governments. This projects also has huge impact on these stakeholders for the same reasons previously mentioned

- Competitors
  - Other Banks
  - Other financial institutions that provide same kind of products/services or substitutes

- Bank's partner involved in the projects: that includes all people / group of people / companies that work with the bank:
  - Consultants
  - Outsourcer
  - other

- People working for the bank but not involved in the project: Such people also are impacted by the projects because, amongst other reasons, once implemented, new CBT may change, replace, etc. their work
  - Employees of the bank
  - Externals employed by the bank

- Other

Stakeholders involvement is a key step for program to succeed. If bank managers know every stakeholder, their needs, expectations, and requirements, they increase chance to know how to successfully work with them to get their involvement. Eskerod and Huemann (2013) differentiate two variations of stakeholder relations within project management:

1. Management of stakeholders: treatment of stakeholders as means to an end, and does not take the needs of the stakeholder as seriously as the needs of the project

2. Management for stakeholders: treatment of stakeholder as having value and importance in the decisions of the program and that good solutions may lead to a "win-win" situation between both parties thus leading to a bigger involvement of each party

However management for stakeholders is not an easy task as stakeholders may have conflicting interests and desires that might be difficult balance. In order to efficiently manage stakeholders' relationship, a lot of information must be gathered and documented. Such information may include the stakeholders' interests ("win conditions"), involvement, expectations, importance, influence, and impact on the project's execution as well as any specific communications requirements. Once stakeholders have been identified and bank has rated their level of interest and involvement in the project, they can be grouped in classes with specific treatment applying for each specific class. It will allow a customization of the relationship, and deeper the precision of the class, more personalisation of the relation, stronger the relationship (but also more effort involved). Management of the relationship with stakeholder could be compared with customer relationship management. The more the relation is personalised and efficient, the most relationship is strong, and the more both parts are involved in relationship to achieve specific goals.

To build such relation some tools may be used summarising, for each stakeholders, their related information, their main objectives, their classification and their domains of expertise

- The stakeholder register that is used to record a general overview of each stakeholder and their planned/forecasted role on the project. As stakeholder identification is a continuous process, you will have to keep updating this document throughout the project life cycle. (Such a document may not be revealed to everybody. It is thus advised to store it in a secure place and restrict its access to allowed users) [Q] (example of template in Annexes [cf. Stakeholders register - example])[AO]
- Capability/skills Matrix that assesses, for each stakeholder capabilities/skills at the program level in two dimensions, the expertise domains and the depth of knowledge. Such matrix should be filled by each stakeholder and will give the bank a good vision of each stakeholder's capacity, which will allow the banks to adapt its communication with the stakeholder depending on its knowledge [U] [AP] (example of Capability/skills Matrix in Annexes [cf. Capabilities / skills Matrix - example])

4.3 Main Constraints and Assumption definition

Once main goals have been defined, management of the project in association with key stakeholders should define the main constraints and assumptions of the Core Banking Transformation that fix the "boundaries of the project". The project management plan needs to change if constraints change or assumptions are proven wrong. Constraints and assumptions need to be identified, tracked and effectively controlled during the project life cycle. [S]

A constraint, in project management, is any restriction that defines a project's limitations; the scope, for example, is the limit of what the project is expected to accomplish.

Project management usually defines 3 main types of project constraint: Scope, time, and budget.

- Scope Constraints: Defines the minimum features, objectives and requirement that are absolutely required in the new Core Banking Transformation (e.g. current payment processes should be supported in the new system, etc.)
- Time Constraints: Defines the maximum amount of time that the bank is ready to "wait" to get required changes (e.g. bank should be able to provide instant payment to its customer within the next two years)
- Budget constraints: Defines the maximum amount of money the bank is ready to invest to get the define result on the defined period (e.g. Bank is ready to invest up to 75millions euros in the transformation of he Core Banking System)

However regarding the high degree of bank control by regulator and the central place that occupies CBT in order for the bank to be compliant, a fourth constraint is added which is the regulatory constraint

- Regulatory constraints: Defines rules that the bank has to follow or implemente within its processes.

These types of project constraints are considered to be somewhat mutually exclusive as it is assumed that making a change to one constraint will affect one or more of the others. For example, increasing the scope of the project is likely to require more time and/or money. [P]

For each project it is a good practice to get a "Constraint Log" that record the main information regarding defined constraint (ID of the constraint, ID of the project, Type of constraint, Identification Date, Completed date, Owner, Status, Validated by, Comment) and enable team to track them and ensure that projects will not overlap them. (example of constraints log in Annexes [cf. Constraint / Assumptions log template - example])

Once defined and agreed by all by key stakeholders, constraint of the project should be communicated to all the stakeholders. Once again this process is an iterative process that will evolve during the whole project as constraints may be refined, changed, cancelled, overlapped, etc. Each constraint should clearly be assigned to a person or a group of people that are responsible for control it and report their evolution regarding program.

A Guide to the Project Management Body of Knowledge (PMBOK® Guide) defines assumptions as "factor in planning process that is considered to be true [...] without proof or demonstration. Assumptions analysis looks at these beliefs from the polarized perspective of validity and falsehood, analysing the projected impact from both reference points to estimate the impact of the valid assumption as well as the impact of an unverified assumption that later proves to be false". An assumption is a belief of what you assume

to be true in the future. You make assumptions based on your knowledge, experience or the information available on hand. These are anticipated events or circumstances that are expected to occur during your project's life cycle. Assumptions are supposed to be true but do not necessarily end up being true! When they turn out to be false, it can significantly affect your project significantly. Such "uncertainty" adds risks to the project.

The management of assumptions is all the more crucial in Core Banking Transformation programs as these are generally of great complexity. Due to the constant evolution of the financial sector and the size of the program, the bank is obliged to rely on several assumptions in order to be able to progress in the planning and implementation of the new system without having to wait for those to be confirmed.

If the assumptions prove to be skewed, this could have considerable impacts on the entire program. This explains why management is set up in order to regularly check the validity of the assumptions, to update the ones that must be, to analyse the consequences and risks that would result from an erratic assumption, and also to communicate the assumptions to all members of the project team [AQ]

As for the constraint, it is a good practise to get an "Assumption Log", for each project, that record the main information regarding defined assumptions (ID of the assumption, ID of the project, Identification Date, Completed date, Owner, Status, Defined by, Comment) and enable team to track them and to control the evolution while analysing potential impact if assumption is finally wrong. Those two topics are generally stored in the same log as they have direct repercussions on each other(example of assumptions log in annexes [cf Constraint / Assumptions log - example])

4.4 Objectives definition: Cardinals points of the project

4.4.1 Division of the transformation program into several projects driven by objectives

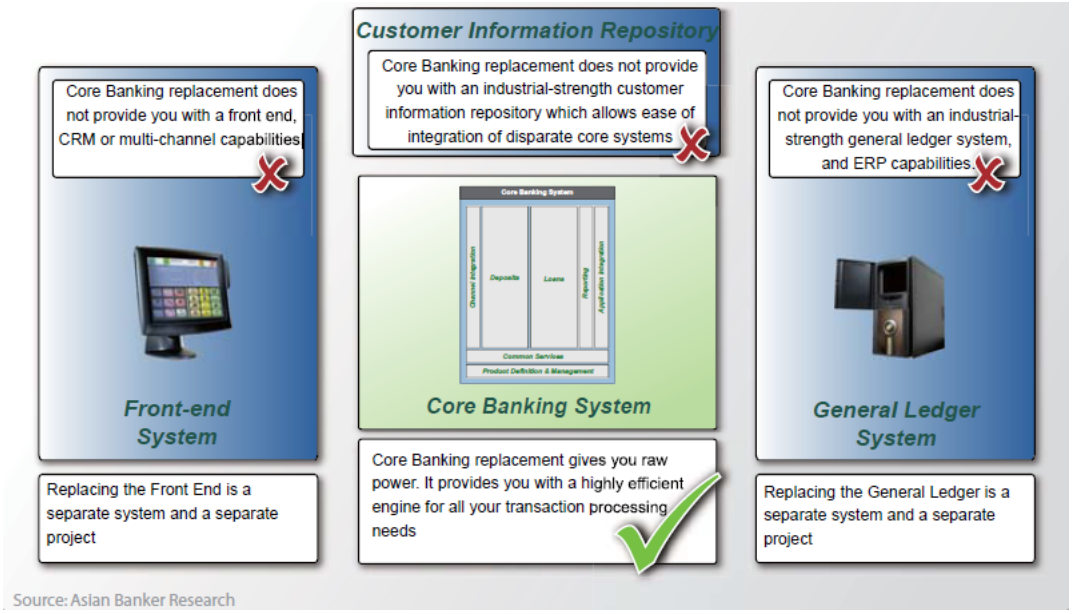
Once main goals are defined, first list of stakeholders is created and first constraints and assumptions are identified, it begins the strategy implementation processes, starting with questions like "How to achieve such goals". As described in previous part, Core Banking Transformation programs are the biggest, most expensive and riskiest project for a bank. So they are too big, too risky and too expensive to be tackle in once. In additions goal fixed generally remain quite vague by definition. Thus in order to get as close to the goal as possible, programs are generally divided into several projects with specific allocated goals and budget. Each of these project should achieve a define objective whose achievement brings the banks closer to the main goals set. Definition of objectives is based on the estimation of the company's progress capacities, and on the business drivers (i.e. conditions external to the company, linked to the sector of activity such as competitive/legal constraints, etc.) At the end of this stage, and in order to

allow optimal management, objectives must be formalized, structured, prioritized and rationalized. Each of them must also be clearly assigned to an owner responsible for its accomplishment. Indeed, the allocation of responsibility is a key step to finalize the definition of objectives because it implies negotiation on the feasibility of the objectives, and obtaining an agreement between the stakeholders. Designating who will be responsible for achieving the objective imposes their negotiation with these managers, and therefore their communication and validation.[BJ]

By definition, objectives are operational (in opposition with goals that are strategic) and define strategies or implementation steps to attain the identified goals [BJ]. Unlike goals, objectives are specific and measurable, and must meet time, budget, and quality constraints. Usually for an objective to be considered as well defined, it should have what is called the SMART criteria. SMART is the acronym of Specific, Measurable, Achievable, Relevant, Time-Bound

- Specific: includes the "Who", "What" and "Where". Use only one action verb to avoid issues with measuring success [AJ]
- Measurable: Focuses on "How much" change is expected. Should be verifiable. [AJ]
- Achievable: realistic given program resources and planned implementation. It thus has to clearly segment the problem and provides basis to determine elements and plans for the solution [BJ]
- Relevant: relates directs to program/activity goals [AJ]
- Time-bound: focuses on "when" the objective will be achieved [AJ]

When defining the objectives for CBT program, bank should remain focus on goals' achievement while keeping in mind what CBS can do and what is related to other systems (as described in bellow picture [BK])



By looking on the main goals previously defined for CBT, each of them can be divided in a set of objectives whose achievement brings the banks closer to the main goals set:

- Improve customer experience
  - Ensures "any-time and anywhere" banking
  - Develop Mobile and Instant payment
  - Provides customer relationship employees with more accurate, more useful etc. information regarding the client
  - Decrease cost of customers' services and products
  - Develop new product and services aligned with customer requirements
  - Other
- Improve efficiency of the bank [H]
  - Automate basic bank function
    - Automate records of the account holders,
    - Automate deposits and transaction
    - Automate maintenance of ledger records
    - Automate risk calculation for clients
    - Automate reporting processes
    - etc.
  - Facilitate the development of new product/services (through analysis and the development of API permitting third party developers to build applications and services around banks [O])

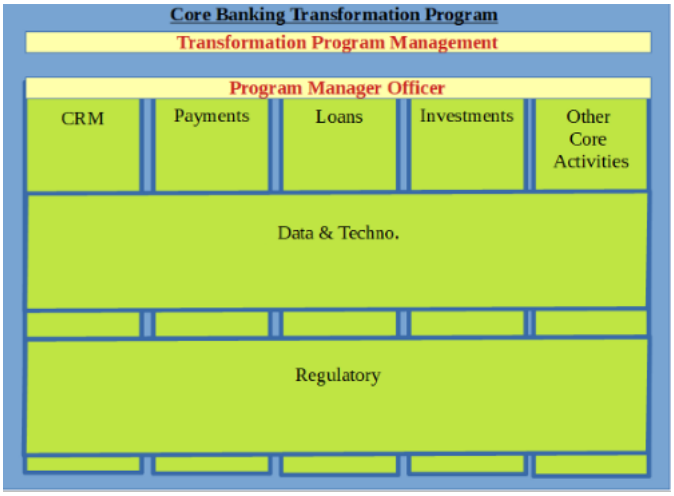
- Facilitate informed decision processes
  - Get one source of truth
  - Store data in proper format (to facilitate access and interpretation)
  - Facilitate the development of data analysis through optimization of data processes
- Be compliant with regulator directives [H]
  - Facilitate generation and transmission of statutory and regulatory reports to the regulators of the government.
  - Facilitate other regulator requirements such as AML, KYC etc.
  - Reduce fraud probability through implementation of stronger technologies

Each objectives may be decomposed into several sub-objective that, when all achieve, permit the achievement of the objective (as describe above by dividing the "automate basic bank function" into several sub objective). Such a sub-division by main section permit to gather in team people specialized into their domain. Regarding the bank, such division could be:

- Payment team: Such team will focus on the integration and development of all payment functionality within the new Core Banking system (Cards, mobile payment, instant payment, etc.)
- Loans team: Such team will thus focus on the integration and development of all processes linked to all types of loans (risk analysis, interest calculation, etc., for mortgage loans, other loans, etc.)
- Invest team: Such team will focus on the integration and development of all processes linked to all types of invest of the banks (risk calculation, ratio calculation, etc. for investment on securities, sovereign bonds, option, etc.)
- Data and technology team: Such team will focus on the implementation of process to enable to efficiently gather data within data Warehouse and Data Mart. It will also focus on the best way to store data and to analysis it in order to produce efficient analysis , etc. Such a team will be transversal as it as to work with every team to understand business needs and determine the best way for the business to use implemented technologies
- Regulatory team: Such team will focus on the implementation of the current and upcoming regulation within the new Core Banking System (MIFID, MIFIR, AML, KYC, PSD2, etc.). Regulatory team will obviously be a transversal team impacting all the other team (e.g. GDPR [General Data Protection Regulation] impact the data and technologies team, KYC [Know your customer] will impact the CRM team, MCD [Mortgage credit directive – Consumer Credit Directive] will loans processes, etc.)

Defined objectives and sub-objectives are obviously inter-related and inter-dependant (e.g. to get better information concerning the customer, data treatment efficiency should be optimized maybe through processes automation)

A central management is obviously still require to permit communication between the different projects. lead the overall process, allocate the budget control evolution, resources consumption, planning and, of course dependencies. To help in such tasks, banks generally implement a specific PMO (Program Management Officer). PMO is a transversal resource/team that promotes progress in the project management development plan to maintain and reinforce the involvement of management in the process, capture the information related to the different projects so as not to lose the associated knowledge. Their tasks include amongst other setting up the organization required for a project, monitoring, project reporting, assistance with strategic decision-making, inter-team communication. The PMO is thus the guarantor of a coherent set of project management methodologies. He can be at the heart of a Center of Excellence in Project Management and have as objective the maturity in project management of his organization. [G][F]



All the objectives and sub-objectives can be considered as projects that should be achieved to realize the main goals of the Core Banking Transformation Program. All these project may be focus to a specific job (e.g. focus on Invest services and products) of the bank or may be transversal with impact on several aspect of the bank (e.g. focus on data management, technology integration and regulatory). As we can see each of these projects may be highly linked and dependant from each other. Such dependencies should be identified and managed all over the projects as it can provide a clearer view of impact propagation amongst the projects. A more specific focus on dependency management will be provided in the sub-section "Dependencies management: unavoidable step for efficient planning" when having a clearer view of the deliverables and tasks of the program. Objectives are may be too abstract and at too high level, while at tasks and deliverables level we can get a more precise view on dependencies and the way to manage them.

4.4.2 Selection of project portfolio

Now that a list of projects has been created (through objectives / sub-objectives definition) and main constraints/assumptions have been defined a crucial decision will be the selection of the project portfolio to be implemented. Indeed, generally speaking, banks will have an opportunity for far more projects than defined constraint can support. Thus selection process must choose a subset of projects to maximize the company's profit goals while obeying to defined restrictions.The strategy includes the processes for preparing project plans, project appraisal, project risk, determining the project's degree of compliance with the organization's strategy, the amount of resources needed for the project, prioritization projects and project selection (Dietrich & Lehtonen, 2005, Ghorbani & Rabbani, 2009).

Poor decisions in project selection have negative consequences: Resources available in inappropriate projects are consumed and the organization loses benefits that could benefit from using resources in appropriate projects (Martino, 1995) . The selection of the right project is linked to the critical success factors of the organizations (Cleland & Ireland, 1994, Hemmatizadeh & Mohammadi, 2019).

The project selection model proposed in this paper is derived from the Multi objective project portfolio selection model proposed by Kamal Baqeria, Emran Mohammadia and Mahsa Mofrad Gilania [AR]. It aims to maximize the benefits by taking into account the constraints identified and some dependencies between projects.

Selection Model:

The assumptions are as follows:

- Quantitative and qualitative objectives are considered.
- All selected projects should be completed at the end of the planning horizon.
- The planning horizon of multiple time periods is considered.
- The rate of resource consumption and the amount of resources are pre -determined for each period of time.
- Time dependencies and critical dependencies between projects are considered. There are four type of types dependencies. For each of those dependencies, there are a dependant project (called successor) and a project from which the successor is dependant (called predecessor):
    1. start – start : successor shall not start before the start of the predecessor (e.g. development of process to analyse customer data can start once deployment of consolidated data base for clients data has started) [AS]

2. start – end : successor shall not start before the end of the predecessor (e.g. automation of loans processes may not start before automation of the records of account holders) [AS]
3. end - start : successor shall not end before the start of the predecessor [AS]
4. end - end : successor shall not end before the end of the predecessor (automated production of regulatory reports cannot end before the end of the data source consolidation regarding reporting data) [AS]

Critical dependencies exist when project I may not exist if project J do not exist or in the opposite direction, if project I may not exist if project J exist. As for the time dependency, the dependant project (I) is called successor while the other (J) is called successor. (attention point, in the case where I cannot exist if J exist, the dependencies exist in both direction – i.e. predecessor is also successor and conversely)

Symbols used: The assumptions are as follows:

1. N: the number of Projects
2. C: the cost constraint to take into consideration. Resources needed as well as investments (software, hardware, other) are gathered into C
3. T: the time period to take into consideration (we assumed that T is the number of working days starting when one of the project within the portfolio start)
4. CD_{ij} : Critical dependency between project I and J. It takes the value 1 if project i cannot be implemented if j is not implemented, -1 if i cannot be implemented if j is implemented and 0 otherwise
5. SS_{ij}: The Start – Start dependency between two projects. It takes the value 1 if project i is predecessor in a start to start dependency and j is the successor, 0 otherwise
6. SF_{ij}: The Start – End dependency between two projects. It takes the value 1 if project i is predecessor in a start to end dependency and j is the successor, 0 otherwise
7. FS_{ij}: The End – Start dependency between two projects. It takes the value 1 if project i is predecessor in an end to start dependency and j is the successor, 0 otherwise
8. FF_{ij}: The End – End dependency between two projects. It takes the value 1 if projects i is predecessor in an End to End dependency and j is the successor, 0 otherwise
9. AR: The aversion risk ratio of the society. Such ratio should evolve between 0 and 1 with 0 means that the bank do not care about risk and 1 that the bank do not want to take any risks:

10. R_{it}: risk linked to the project i which starts on time t. Risk could be defined as the variance associated with a project regarding the defined constraint (i.e. variance of the costs [with a fixed scope and duration], variance of time [with a fixed cost and scope], variance of delivery scope [with a fixed cost and duration]). We assume that risk is linked to time for multiple reason. For example if the project start at the very last possible start date [I.e constraint (2)] bank may have to invest more budget to ensure the project to finish on time in case of deviation from the planning

11. B_{it}: Benefits linked to project i which starts on time t. We assume also that benefit may also be dependant from the time for multiple reason. For example if bank release a new innovative feature before its competitors, the sooner the feature is released, the higher the benefits

12. $D_{c_i i}$: duration of the project I. Here we put the assumption that the duration of the project is linked to the amount of resources invested in the project (which is linked to the project's cost)

13. C_{it}: cost linked to the project i which starts on time t (cost refers to the resources consumption, as well as on the investment required [e.g. software, hardware, etc.]). We assume that cost linked to the project I is dependant on the start date for many reason (if the project start at the end, more money need to be invested to decrease the duration to respect time constraint [I.e constraint (2)]

Proposed model is a multi-objective planning model that aims to maximize profits while minimize risk depending on bank's risk aversion

Constraint

$$X_{it} = 1 \iff \textit{project i start on time t, 0 otherwise} \tag{1}$$

$$\forall i,\ X_{it} = 1 \Rightarrow 0 < t \leq T^{\vee} D_{c_i i} \tag{2}$$

(2) i.e. the project cannot start on time t if, due to its duration, it will end out of the defined time period

$$\sum_{i=0}^{N} \sum_{t=0}^{T-D_{ic}} C_{it} * X_{it} \leq C \tag{3}$$

(3) i.e. the sum of all projects' costs shall not exceed the cost constraint

$$\forall CD_{ij} = 1,\ X_{it} = 1 \Rightarrow \exists t_2,\ X_{jt_2} = 1 \tag{4}$$

(4) i.e Critically dependency between project i and j (i require j to be implemented)

$$\forall CD_{ij} = -1,\ X_{it} = 1 \Rightarrow \forall t_2,\ X_{jt_2} = 0 \tag{5}$$

(5) i.e Critically dependency between project i and j (i require j not to be implemented)

$$SS_{ij} = 1 \Rightarrow X_{it} = 1 \Rightarrow \exists t_2 < t,\ X_{jt_2} = 1 \tag{6}$$

(6) i.e. project i is dependant from j with start-start dependency, thus j has to be started for i to begin

$$SF_{ij} = 1 \Rightarrow X_{it} = 1 \Rightarrow \exists t_2,\ t_2 + D_{cj} < t,\ X_{jt_2} = 1 \tag{7}$$

(7) i.e. project i is dependant from j with start-end dependency, thus j has to be finished for i to begin

$$FS_{ij} = 1 \Rightarrow X_{it} = 1 \Rightarrow \exists t_2 < t + D_{ci},\ X_{jt_2} = 1 \tag{8}$$

(8) i.e. project i is dependant from j with end-start dependency, thus j has to be started for i to be finished

$$FF_{ij} = 1 \Rightarrow X_{it} = 1 \Rightarrow \exists t_2,\ t_2 + D_{cj} < t + D_{ci},\ X_{jt_2} = 1 \tag{9}$$

(6) i.e. project i is dependant from j with end-end dependency, thus j has to be ended for i to finish

The result of the model should be a set of projects that maximize the returns (Benefits-Costs) while minimizing the Risk. The equilibrium between those two equation is given by the Risk ratio RA of the bank. The proposed model will thus be:

$$\max Return = \sum_{i=0}^{N} \sum_{t=0}^{T-D_{ic}} \frac{B_{it} * X_{it} - C_{it} * X_{it}}{1 - RA * R_{it}} \tag{10}$$

Proposed model is a good tools to get a pre-selection of a set of projects however management may face 2 main issues while implementing it:

1. Problem of estimation of the parameters: Of course main difficulty when using such optimization model is to estimate as precisely as possible the different parameters. Indeed the objectives / sub-objectives level is too abstract and too "high-level" to get a precise estimation of the parameters. Precision will come with the analysis of requirements deriving from the selected objectives. It thus lead to a vicious circle: Bank need to select objectives to analyse the requirements arising but this analysis will provide the details required to select the optimize set of objectives. Indeed, as previously explained, this is not a one way process rather an iterative one. In order to select the first set of objective, banks generally approximate the parameters using historical data from similar projects. This is not an easy exercise since most of the banks never had to perform such kind of transformation program. Managers will thus has to perform the estimation using the best proxy they get (IT projects, etc.)

2. Assumptions taken are generally wrong:

- Benefits of a project is independent from the other projects. Indeed, depending on the implementation of other project the overall benefits will change (Benefits of implementing I and J is rarely equal to Benefits of implement I + Benefits of implementing J). This is due to several reasons. As an example the overall

Risk Matrix	N Successor				
N Predecessor		1	2	...	N
	1	1	1,1	...	1
	2	1,2	1	...	0,8
	...	...	...	...	...
	N	1	0,8	...	1

Table 1: Evolution of projects' risk depending on other projects implementation

benefits from implementing an efficient face to face on-boarding and implementing an efficient mobile on-boarding will be less important that the sum of the benefits from these two projects

- Risks of a project is independent from the other projects. The same relation applies for the risk and risks will evolve depending on the implementation of other project (Risk of implementing I and J is rarely equal to Risks of implement I + Risks of implementing J). This is due to several reasons. If several project of automation are implemented, the resources allocated to these project will develop expertise and will be less likely to commit mistakes. On contrary propagation of mistake may increase the risk to other project. As an example, if error is committed when automating payments, there is a big possibility that this mistake will impacts the development of mobile payment, thus increasing the risk

- Cost of a project is independent from the other projects. Once again, cost to implement project I and project J is rarely equals to costs to implement I + costs to implement J. As for the risk development of expertise in some project may decrease the cost of other project while increasing of the risk may push the bank to invest more resources on testing for example thus increasing the costs.

Proposed solution would be to defined a matrix giving an approximation of impacts that the implementation of projects (predecessors) may have on other projects (successors) as shown on bellow example (table 1) showing how risks linked associated with project will evolved depending on the implementation of other projects. In the example, it is estimated that project 1's risks will be multiplied by 1,1 in the case where project 2 is implemented while implementation of N do not impact risk related to project 1.

Such kind of matrix allowed a clearer vision of inter-dependencies between multiple projects implementation. However it is based on the supposition that relation between projects are constant and independent from other projects' implementation. This is generally not the case. As example if three automations project are possible and manager selects to implement two of them. The risk associated with the second will be decrease for reasons explained above. Now, let's suppose that the tree are implemented. The risk will continue to decrease but not in the same proportion. (Impact of the first project will be more important than the second). More precise view may be created through

Risk Matrix	Portfolio				
Projects		1,2,4,7	1,2,3,4	...	1,3,..,N
	1	0,99	1,23	...	1
	2	1,11	1	...	0,8
	...	...	...	...	...
	N	1	0,89	...	1

Table 2: Evolution of projects' risk depending on portfolio selection

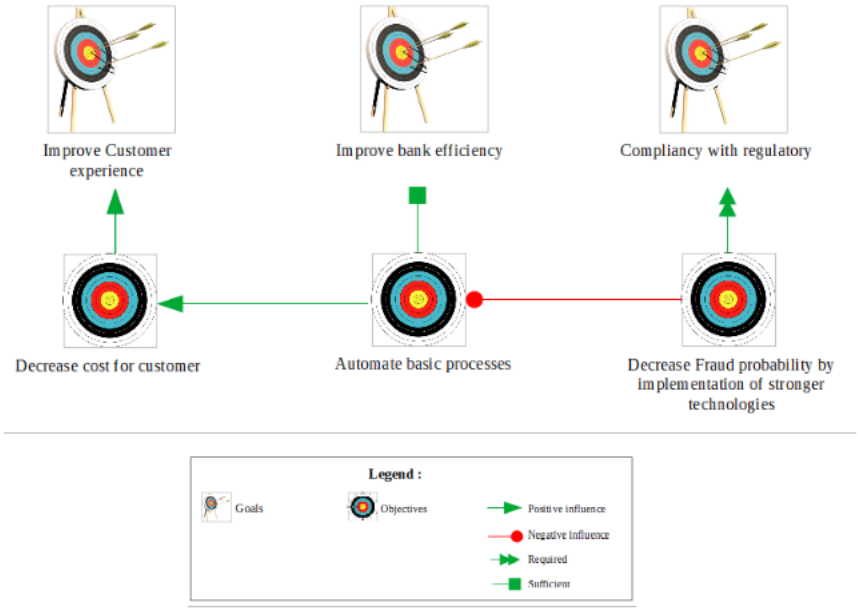
the creation of a matrix giving the evolution of risks, costs and benefits for each projects depending on the portfolio selected as showed in the table 2. Creation of such a matrix will however definitively add a lot of complexity to the portfolio selection process. Indeed, number of column of such matrix will exponentially grow with the number of possible projects.

Matrices are powerful tools for this kind of problem, however they have the disadvantage of not being user friendly. In order to encourage negotiation between key stakeholders, it is therefore often useful to develop a graph of objectives/goals which makes it possible to show in concrete terms the decomposition of goals into a set of objectives, or that of objectives into a set of under objectives. Furthermore, the design of the graph makes it possible to highlight the main dependencies and interconnections that exist between the different objectives/goals. 4 main dependencies can be identified between the different goals, objectives and sub-objectives:

- Positive influence of A on B[1] : In this case, the completion of A will have a positive impact on the completion of B (decrease in cost/risk, or increase in profit)
- Negative influence of A on B[1]: In this case, the completion of A will have a negative impact on the completion of B (increase in cost/risk, or decrease in profit)
- A is necessary for B[1]: In this case, we assume that B cannot be reached if A is not reached
- A is sufficient for B[1]: In this case, we assume that if A is reached, then B is reached.

Below, an example of a goals / objectives diagram focused on a subset of previously identified goals/objectives to illustrate the different dependencies:

[1]Here A and B are associated to defined Objectives/Goals



Goals / Objectives Diagram

In this example we can see that process automation will have a positive effect on reducing costs and therefore, ultimately, on improving the customer experience.
In addition, depending on the intensity of the "Improve bank efficiency" goal, this automation may be sufficient to achieve the set goal.
The implementation of cutting-edge technology to reduce the likelihood of fraudulent behaviour is also a necessary condition for the bank to be compliant with the regulator (cf. MAD/MAR & AML).
However, implementing controls to prevent fraudulent behaviour will complicate many of the bank's processes. This will therefore have a negative effect on process automation

Once the negotiations between key stakeholders have resulted in the identification of a set of clearly identified objectives, it is necessary to:

- Assign them each separately to well-defined owners who will be responsible and accountable for achieving the objective in question. Generally each objectives implies close interaction between Business and IT. Most of sensible decision should be made taking into account both point of view. In order to avoid "parallel worlds", it is highly recommended to attribute each objective to two owners/leaders (IT and business) and to implement joint teams made up of business and IT staff.

- Prioritize the objectives between them. To prioritize these objectives they should take into account the benefit obtained by the completion of these, their criticality (are they necessary for the achievement of a defined goal?), as well as the links/dependencies existing with other objectives.

It is generally advisable to list all the selected objectives in a table. Below, a typical example of objectives' properties to be entered in the table (the definition of the attributes below is mainly taken from the book "TOGAF Archimate UML and BPMN" [BJ] to which the author added some characteristics deemed useful for optimal management) [Example in annexe]:

- ID of the objective
- Name of the objective
- IT owner of the objectives
- Business owner of the objectives
- Description of the objective
- Unit of measure in which objective will be measured
- Target value (value to reach to meet the objective)
- Current value (value measured on the objective definition date)
- Main risks description (Give a brief overview of the main risk that could prevent objective's achievement)
- Source (Origine of the objective) [which Goals / Objective is (partially) achieved through this Objective completion]
- Status (Not started / Ongoing / Cancelled / Closed)
- Estimated date of achievement (When the Objective should be achieved)
- Criticality (Is the Objective critical to allow success of the project)

Once Goals, objectives and constraints have been defined, prioritized and formalized, bank has a more precise view of what should be achieved and may generally be able to select the approach that will be taken for CBT. It thus need to consider its defined objectives and perform a delta analysis to manage selection criteria development for the new system, Tree possibilities exist in the way it will replace its CBS (this is the eternal debate between "build" or "buy"). [BK]

- In-house development and implementation (More suitable for large bank): When selecting this solution, bank will keep ownership of software an hardware, enabling for "personalised" implementation. This approach will imply higher cost and sufficient in-house IT expertise to be successfully achieved. [BK]
- Purchase of system software and services (adopted by many medium and small bank): When selecting this solution, bank will keep ownership of hardware while system integrator will be hired for software (vendor will customise, integrate and implement solution according to bank's requirements.). The choose of the vendor/software is thus critical. [BK]

- Complete outsourcing: In this approach, both software and hardware will be outsourced. Application Service Provider (ASP) will be hired to collect bank's needs and then to maintains the accounts and branches using its own data centre. The charges will be calculated on per transaction or per branch basis. ASP will thus provide expertise but will let little place for "personalisation" of services/products [BK]

At this stage of the program, the decision generally goes no further than the selection of the approach (In house, purchase of system software & services or Complete outsourcing). Indeed, identification of required developments [in case of In-house approach], selection of the software and the vendor [in case of purchasing] or selection of the ASP [in case of outsourcing] will latter and in general with the consultancy of the Technical Architect(s). [cf section "Baseline Versus Target situation: Evaluation of the gap to define the path"] In addition, in some cases, the decision on which approach to take may still be unclear. Final decision will therefore come slightly later in the requirements engineering, when the banks will have a clearer vision of these needs and the optimal way to achieve them. However by focusing on defined objectives, bank should be aware to highly decrease the indecisions regarding final solution (e.g. if the decision has been taken to go with the purchasing of system software or the complete outsourcing, bank should be able to highly reduce the number of potential solutions/ASPs eliminating those that are not aligned with the define objectives/constraints. [keeping only few "participants"])

5 Requirements engineering: Clarification of the destination

In order to get a clearer vision of the way each objectives will be achieved they will be decomposed into a set of requirements. Karl Wiegers [AT] defines requirements as being *"specification of what should be implemented. They are descriptions of how the system should behave, or of a system property or attribute."*
The "business book of knowledge" define the following properties that requirement should meet [BJ]:

- Allocable: can be assigned to a system component, where it can be implemented
- Achievable: Technically feasible within the constraints set
- Complete: Documentation of known requirements and all conditions under which they apply. They must contain the information necessary to design an evolution, and verify that a solution satisfies them
- Correct: Must describe precisely the expected function or condition. The originator of the requirement is the only one able to validate this point
- Not solution-oriented: must be expressed in a way that leaves the widest possible choice to the implementation options
- Measurable and testable: Requirements must be designed to verify that the solution meets them
- Consistent: Must be able to be met without causing conflict with another requirement
- Necessary: Must be essential to meet business objectives. The requirements must be traced relative to the objectives to verify their necessity
- Hierarchical: A priority is assigned to each requirement in order to indicate whether it is essential for a particular version of the system in order to allow choices to be made and avoid going beyond the constraints set.
- Traced: Their source must be known (e.g. a person, business rule, ...) and the identifier must be unique
- Unambiguous: Interpretation should be the same for all readers. It is best to redirect them in simple and concise terms. The use of terms from a pre-established trade glossary favors obtaining this quality. Must be easily understood by solution designers
- Understandable: Must be easily understood by solution designers

Requirements management is central to a CBT as it applies to all phases of the program. Requirements engineering thus is an iterative process allowing faster discover and correction of incorrect assumptions (mainly based on ambiguity). (e.g. iterative process allows

the user to receive feedback much sooner on the developer's interpretation of the requirements, and to then correct problems as they are found.) [AI]. In addition, requirements should not be split depending of the architecture type as it express an external vision of the system and form an inseparable whole [BJ]

As for the selection of objectives, requirement may also be compared to optimization problem. First step thus will be to define the feasible domain. Resolution of optimization problem can generally be divided into tree main steps:

1. Definition of the feasible domains
2. Calculation of parameters values
3. Selection of the optimized feasible set

In requirements engineering, the feasible domain while be defined through elicitation of the requirements and main constraints. The parameters will be evaluate during requirements analysis. Finally optimized set will be selected through the negotiation and validation of requirements.

5.1 Core Banking transformation's requirements elicitation

In an optimization problem, feasible domains concerns all the possible points satisfying the constraints of the problem. This is the initial set of solutions proposed to the problem. [AL] In project management the definition is similar and the feasible domains should give an overview to the management of what could be expected from such a project and what is not feasible. According to author such a step is necessary to help management in their decision by solving two main issues :

1. Possibility of not being aware that something is possible. As said by ford "If I had asked people what they wanted, they would have said faster horses." [N] Indeed, to take informed decision managers should be aware of the possibilities that exist in order not to focus on insignificant issues.
2. Wrongly believe that something is possible when it is not which may create unrealistic expectations and may lead to waste of time and resources.

This step will be processed through requirement elicitation resulting in a list of feasible, while not yet approved requirements determining what are the possible expectations of such project. Most of the problem faced during elicitation step may be grouped into three categories [AI]:

1. Requirement's scope problem, when the requirement address too little or too much information. (i.e. System has ill-defined boundaries, unnecessary design information provided)

2. Requirement's understanding problem, within groups as well as between groups such as users and developers, IT people with business people. (e.g. Users do not fully understand their needs as well as computer capabilities/limitation, Poor understanding of problem domain by the analyst, difference of language between analysts and users, omission of "obvious" information, conflicts in users' points of view, etc.)

3. Requirement's volatility problem due to the previously described changing nature of requirements. Thus requirements that was previously accepted may become unusable due to change of information, scope, etc.

The idea to create the first list of requirement will be do divide the different goals into a set of requirements whose completion should achieve the fixed goals (and maybe more)

Identification of relevant source of information First step in requirements elicitation will be to clearly identify the relevant source that should be able to influence requirement elicitation process. (if too much people are involved, requirements' elicitation could be confusing and noisy while if too few are involved the elicitation can result in missing requirements) Different team will be create to work on this topic under the lead of each objective's owner. It means that the defined owners will be in charge of the identification of relevant sources of requirements, the determining, documentation and refinition of their wish list to create "viewpoints" and identification of the non-functional requirement (e.g. CBS must be able to ensure Xk transactions per hour, etc.). The listing of relevant source of information can be decomposed into the following steps [AU] :

1. Identify business owner that will be responsible and accountable for identifying and manage stakeholders involved in the process. In our case, this role will be assigned to objective's owners.

2. Identification of all candidate stakeholders thus resulting in the completion of the stakeholder register (cf "4.2 Stakeholders Identification and management") with potential new/missing stakeholders

3. Evaluate candidates and select stakeholders. To ensure a complete vision during the elicitation of the requirements, the author considers that the business owner must include within selected stakeholders:

    - Stakeholders involved in processes of the current functioning of the legacy system regarding the subject of the objective (e.g. for the objective "Develop Mobile and Instant Payments", it is necessary to have experts who know the current functioning of the payments of the banks, the potential legislation / directives surrounding these payments, etc.). In order to ensure a global vision, the team must always include at least an IT and a business expert. in order to identify these people, it is advisable to divide the current functioning of CBS into a set of key processes (max 10 [BL]) linked to the "domain" of the defined objective and to list all the actors involved in these process.

- Person of Contact coming from each of the teams linked to objectives having a dependency relationship with the objective analysed (cf. goals / objectives diagram in section 4.4.2). The aim here is to ensure fluid communication between these teams from the start of the project and to allow the most informed vision possible in future decisions.
- In the event that envisaged solution is the purchase and implementation of software or complete outsourcing, a set of contact points / experts concerning the solutions / ASP envisaged which will make it possible to offer details concerning their proposal as well as the limits of the solutions envisaged
- Other people that are considered as important in the requirements engineering processes depending on the defined objective

4. Understand roles and responsibilities of stakeholders: In this step, the use of a RACI matrix (Responsible, Accountable, Consulted, and / or informed) can be a powerful tool as it describes the role of the parties in the completion of work on a business process project.

5. Identify a SPOC (Single Person Of Contact) representative for each stakeholder group: This step is necessary as it is impossible to take the time to discuss with all the stakeholders of a certain type. The different stages of requirements engineering will therefore be mainly carried out with appropriate representatives speaking on behalf of a stakeholder community (Due to their importance in the process, their selection is essential). In optimal situation SPOC should understand the business domain, the specific problem, the requirements-engineering process, the associated technology, etc. In addition he must faithfully represent its community requirements, be supportive of the system and the requirements definition process, be well respected, and, of course be available to actively participate in requirements engineering process

6. Prioritize stakeholders: In order to facilitate needs analysis and decision-making, it is strongly recommended to group the stakeholders into a set of categories and to explain the priority and rights of each category. Indeed, the prioritization of actors gives more weight to certain decisions allowing easier identification of "conceptual spaces". In addition, the appearance of contradicting contradictory requirements being a quasi certainty, by giving priority to the different stakeholders, it will facilitate the decision in favour of one or the other option. Finally, the priority of the stakeholders will help the engineers of needs to prioritize their activities of solicitation and development, in particular at the beginning of the process.

Identification and documentation of the requirements Once key stakeholders have been identified, They should work together in the creation of a requirements list to define what should be the expectation of final solution implementation. Many different techniques can be used to bring out the required features of the future CBT. In order to perform the elicitation of the requirements, 4 main types of techniques exist [BN]:

- Conversational: Requirements are collected via a direct communication channel between engineers and stakeholders (mainly unsolicited requirements)
- Observation: The requirements are collected via an indirect channel (observation)
- Analytic: Requirements are collected via an additional indirect contact channel to extract needs pro-actively
- Synthetics: The requirements are collected via a mixture of direct and indirect contact. (collective effort to clarify the characteristics of desired products)

The border between the different types of method is often blurred. The selection of technique must be made according to the understanding of problem area, the types of requirements' source, the organizational context, etc. In this paper, we will not focus on the selection of methods / techniques to be implemented to collect the set of requirements. If the reader wishes to have more information on the subject and on the comparison between different techniques, he can consult the paper "Effective Requirements Development - A Comparison of Requirements Elicitation techniques" by Zheying Zhang [BN].

Once a first elicitation of requirements has been produced, these requirements should be documented in a common format to facilitate understanding and negotiation of these. Ideally, the template should at least have the following attributes [BO]

- Unique ID
- Comprehensible name
- A brief description of the requirement understandable by the business and various stakeholders
- Type of the requirement: It can either be :
    1. Functional describing the basic functions that the target system will have to offer. These are generally, for the most part, user-defined requirements that will be directly visible in the final product (unlike non-functional requirements). (e.g. the bank's clients must be able to access account information via the internet with their username, password and token)
    2. Non-functional: For the most part, these are quality constraints that the target system must have. They deal in particular with portability, security, maintainability, reliability, scalability, performance, re-usability, flexibility, etc. (e.g. the system must be able to support and complete at least xxxK transactions per minute without crashing). Specifying non-functional requirements requires knowledge of the functionality of the system, as well as knowledge of the context in which the system will operate.
- A version number of the requirement allowing to trace the evolution of the latter (which is inevitable during a project)

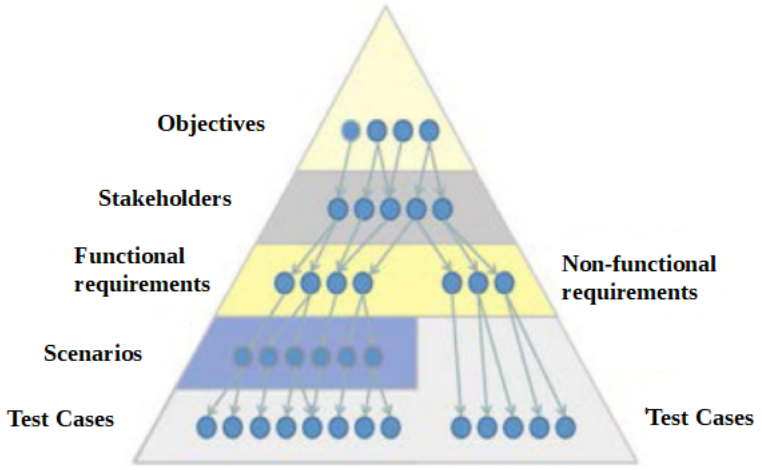
- The requirement change history. Documenting and maintaining the requirements history is a process that may seem cumbersome and which aims to ensure:
    1. That the teams work well on the same version of the requirements
    2. A good understanding of the changes made to the previous / initial version and the reasons for these changes

- A status (waiting approval, approved, cancelled, closed). "An analysis of status metrics makes it easier to identify the causes of delay / postponement of certain elements of a project. (eg at a time T, identify the requirements actually created but still to be approved x months later. This kind of analysis leads to a questioning such as: "What is the problem?", "Why do I have 50 requirements which have been deleted, suspended or postponed?", "What is the cause?", "Why will this not continue?", etc.)

- An assessment of the priority of the requirement. This data is key information in the requirements management process allowing to separate the "must have" from the "desired" and to provide a degree of priority to the "desired".

- Requirement owner who will be the reference person to provide additional information in case the requirement is not understandable by all or is incomplete. Identifying the owner of the requirement is a critical step for the future. In the event that, during the negotiation of the requirements, this cannot be validated (due to defined constraints for example), it is in particular towards this person that the bank will have to turn in order to consider alternative options are possible as a substitute for the requirement in question. (The identification of a back-up person is also recommended in the event that the owner is not available (e.g. sick leave, departure, etc.)

- Information linked to the requirements traceability (i.e. Objective's name / ID to in which the requirement is included, list of stakeholders involved in the process, etc.) The diagram below [AO] shows how traceability begins with the previously defined objectives and traces the requirements of the stakeholders, the functional and non-functional requirements that will ultimately define the test scenarios and test cases.



Requirement tracing [AO]

5.2 Core Banking transformation's requirements negotiation and validation

As explained in the previous section, once the feasibility area has been established, it is necessary to select the sets of requirements that will be retained and validated in order to determine the functionality of the target system. The validation of requirements is a key process which should not be underestimated. Indeed, a change in decision a posteriori can be very expensive for the bank especially if this change is decided very late (e.g. if the bank decides to cancel a requirement when all the analyses have been finalized, this will have generated an unnecessary cost) . It is therefore important that the main stakeholders are involved in this process and participate in the negotiations and validations of the various requirements. Indeed, stakeholders involved and in agreement with the selected requirements will be better able to carry out the projects.

In an ideal setting, each stakeholder is a "winner" in the realization of the project / program. This principle is particularly relevant in the field of software, which is a staff-intensive field whose products are often unfamiliar with the concerns of users and management. Finding a situation that makes each participant a winner may seem utopian and unrealistic, however, there are win-win situations and efforts should be made to identify them.

To do this, managers must pay particular attention to the interests and expectations of each person involved (this person being partially identified in the stakeholder register). According to Theory W, this process can be segmented into four stages, the main purpose of which is to create a win-win situation for the negotiating parties[CA]:

1. Separate people from the problem to determine each person's goals

2. Focus on interests, not positions. Sometimes what he thinks he wants is not the most optimal solution and an alternative can act as a substitute

3. Develop options for mutual gain

4. Insist on the use of objective criteria to minimize individual interpretations.

To do this, the WinWin negotiation model offers a set of main activities to achieve a mutually beneficial situation for all participants [CA]:

1. identification of key stakeholders for success (normally already identified in the previous section)

2. highlighting the main conditions for success of stakeholders essential to success (normally already entered in the stakeholder register [at least partially])

3. negotiation of mutually satisfactory win-win situation packages (requirements, architectures, plans, critical components, etc.). During negotiations, the stakeholders "defend" their objectives as conditions for victory. If everyone agrees, the winning conditions become agreements. However, when stakeholders disagree, they identify their conflicting victory conditions and record their conflicts as problems. In this case, options / trade-offs are invented / offered in order to provide mutual gain. This process is iterated until a joint decision is reached on a mutually beneficial agreement. It is important to note that open and unresolved issues represent potential project risks or conflicts that need to be resolved. Indeed, if a stakeholder has nothing to gain from the implementation of a task, they will be less inclined to perform the correct work.

4. Value-based monitoring and control of a win-win balance throughout the development process.

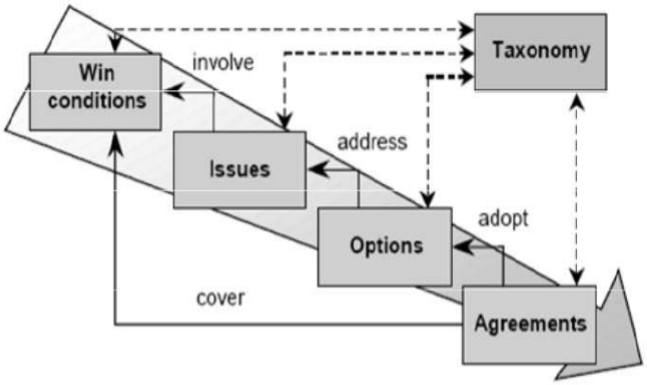
To successfully complete the negotiations, it is therefore necessary to define [CA]:

- Winning condition: capture the desired objectives and constraints of the stakeholder

- Problem: capturing the conflict between victory conditions and their associated risks and uncertainties

- Option: capture a decision choice to solve a problem

- Agreement: Capture the agreed set of win conditions that satisfy stakeholder win conditions and / or enter agreed options to resolve issues



The WinWin Negotiation Model

If the reader wishes more detail regarding the negotiation of requirements, he can refer to the article "Requirement Negotiation Methods in Requirements Engineering" [CA]

Once an agreement has been reached and validated by the project owner and the stakeholders identified as responsible, the validated requirements must be highlighted in the register and, on a regular basis, the different project owners must monitor / communicate these to ensure that these do not conflict with other validated or validating requirements (within their projects or with other projects in the program)

6 Baseline Versus Target situation: Evaluation of the distance to achieve defined goals

Most of the time, knowledge of the original architecture is not clearly established thus leading to the necessity to perform a more or less detailed "overhaul" of the existing. Especially since the transformation, roadmap mainly depends on the analysis of the differences between the initial (or baseline) state and the target situation and the impacts that this transformation has on the company. Next section of this paper will therefore aim to:

- Focus on the analysis of the target and initial architecture both from the business, information system and technical point of view.
- Assess the impact of changes on all facets of the company. The combination of these elements allowing the establishment of a first scenario of the transition roadmap.

The migration from the AS IS architecture to the TO-BE architecture occurs in the form of a trajectory. To be successful, it must take into account all facets of the business and the impacts resulting from these changes. The measurement of the difference between the initial and the target architecture is a determining factor in the choice of the trajectory. Indeed, depending on the size of the differences, the bank will have to divide its program into a greater or lesser number of projects, the good coordination of which will largely determine the success of the operation. It is therefore largely following this analysis that the bank will be able to determine the major aspects of its deployment plans for the implementation of the new Core Banking System [BJ]. Depending on the size of the gaps, the bank can therefore decide:

- Whether opt for a so-called "Big-Bang" approach (without intermediate level) in which all the go-live systems at the same time. Such a strategy is generally possible when the gap between the target architecture and the initial architecture turns out to be limited because, although offering a faster deployment, it also remains the most risky (although the integration problems would be minimized given that the legacy system and the new system do not coexist). Given the size of the Core Banking Transformation programs, the associated costs and the associated risks, it is generally not recommended to opt for such an approach [BK].
- Whether opt for a "stepwise" approach, the trajectory of which will include intermediate stages, the number of which must vary according to the size of the perimeter and the difficulties encountered. This kind of strategy makes it possible to greatly reduce resistance to change and considerably reduces risks by facilitating adjustments. [BK]

The following sub-sections will focus on the analysis of Business, information system and technical architectures in order to get a clear and detailed overview of the projects. People should understand that impact assessment in a transversal way. Indeed each

phase have to evaluate its impact beyond its scope. Indeed, let's suppose that the bank decide to introduce a new product/service (e.g. new type of loan, new portfolio management strategy, etc.), it will inevitably lead to consequences in related database management. In addition, multiplicity and complexity of bank's relationship may leads to several unexpected impacts out of the initial scope. [BJ]

6.1 Scope of the analysis to considered

Although a large part of the bank, being impacted by the change of the CORE Banking system, will have to be analysed, it is necessary to delimit the analysis' scope to keep a vision focused on the evolution brought by the program. Indeed, a complete analysis of the entire bank's analysis would not only require too much work from the teams but also risk diverting the bank from the objectives set. In order to determine the scope to be analysed, two main criteria must be taken into account:

1. All applications, processes, or data flows having a (almost) direct interaction with the legacy CORE banking system must obviously be included in the scope of the analysis because these will be instantly impacted by the change and the bank must be able to guarantee their functioning in the future (or their deletion if these are no longer deemed useful). Although this sounds obvious, it is not always easy to have an exhaustive view of this perimeter (notably because of "Shadow IT" which will be discussed in more detail in following subsection). In addition, indirect interactions may also need to be taken into account. In fact, the CBS generally feeds a set of databases. If for some reason the new CBS does not allow certain fields to be populated, it is important to understand the concrete use of these fields by the bank and to see if actions must be taken to resolve this gap. The bank will therefore have to implement substantial investigative work in order to ensure that they are properly documented before starting the system migration.

2. All the applications, processes, or data flows that currently (partially) meet the objectives and requirements that have been defined by the bank as part of the program. Indeed, the new CBS generally offer additional functionalities compared to legacy systems (these can be managed, for example independently by a third party application). The bank could therefore decide that this functionality should be managed by the new CBS in the target architecture because it allows to get closer to the set objectives. The perimeter is obviously bound to be modified according to the evolution of requirements and objectives which as explained above are subject to the uncertainties linked to the complexity and the temporal scope of the program.

The following sections provide an high level overview regarding the analysis of:

- Business architecture that covers the strategy, objectives, business processes, functions and organization

- Information system architecture dedicated to the organization and management of information and which presents applications, software components and their interactions
- Technical architecture that describes the technical bases and deployed components, networks and physical infrastructure

Different models / artefacts considered necessary for the proper execution of the transformation will be presented, detailed and example will be presented in the annexes in order to illustrate them. To be able to determine the models to be used, they must meet at least one of the two requirements below:

- The view presented is likely to evolve with the implementation of the new CBT (i.e. It is not useful for the program to present a diagram on the organization of the company if it remains unchanged. However, the modelling of processes likely to change will facilitate the identification of gaps by comparing the AS-IS with the TO-BE model)
- The artefact will help stakeholders in the execution of the project (e.g. a dictionary of business terms can still be useful in order to reduce ambiguities although this should not be impacted by the CBT)

6.2 Proposed approach

In general, analysis of the architecture linked to the project to replace the Core Banking system is too important and too complex to be tackle in a single block. It is therefore advisable to divide this analysis into a set of sillos as independent as possible while keeping a transversal view in order to ensure consistency between the different analysis as well as an exhaustiveness of topics to be taken into account. As part of this thesis, we propose to keep an objective-oriented vision in order to perform this analysis (Several methods are obviously possible for segmenting the analysis and are strongly dependant on the organization of the company).

To do this, the first step will be to identify business services that meet the different objectives / requirements previously set. Then each service will be analyzed in order to identify, the different processes that compose it, the applications used and its possible interactions with the CORE system, etc. This study will highlight possible inefficiencies, as well as, depending on the new CBS envisaged, the potential replacement envisaged.

Once the analysis has been carried out in detail for each services, it will be necessary to ensure the completeness of the study. To do this, significant work will have to be put in place in order to identify all of the applications with which the legacy CBS interferes and to ensure that these are properly included in the analysis of at least one service. Otherwise, it should be determined:

- The usefulness of the application in question (is this application still used? How often? For what purpose?)
- The importance of interaction with the CBS (is the information exchanged essential? Unique? Etc.)

By answering these questions, the bank will potentially have to broaden its scope regarding the CBT program.

6.3 Business Architecture

6.3.1 Introduction

From Business point of view, modification of CBS has the following objectives [BQ]:

- Optimizing the marketing of new products
- Ensure compliance with regulatory requirements
- Generate more cross-sell opportunities
- Facilitate innovation in products and prices through increased flexibility
- Obtain a coherent and transparent multichannel experience
- Achieve streamlined end-to-end business processes
- Increase interoperability by standardizing business processes

In order to achieve these objectives, the bank must therefore carry out an analysis of the business architecture as it is and as it should be in the future.

According to Gartner, Enterprise business architecture is defined as "an integral part of a holistic enterprise architecture effort. EBA focuses on the process of evolving "how you run your business [...] to evolve to and support a future state." [BP]. EBA mainly focuses on the following elements [BJ]:

- The implementation of a business dictionary and conceptual models synthesizing the business entities.
- Analysis of the organization of the company (its organizational units, its actors and its roles)
- Description of the company's capabilities (its functions and business services)
- The modelling of the operation of the company (its business processes)

6.3.2 Some useful artefacts

Business dictionary This section will therefore aim to select the points of view to be taken into account, to facilitate the common understanding of the project's participants on the baseline and target business architecture of the bank as well as the analysis of the gap between those two architectures. As explained previously, the alignment of stakeholders with a common vision of the project is one of the key phases to achieve the objectives set by management. Except even in the (utopian) case, where all the stakeholders would be aligned on the completion of all the requirements, this might not be enough, especially in projects as complex as the transformation of CBS. Indeed, even with good faith, a different understanding of certain business terms and their characteristics can lead to gaps in the execution of defined tasks, which, if not dealt early enough, can lead to "correction" costs" very high. It is therefore necessary to align, as soon as possible, the groups of people involved in the project with a common understanding of these and their characteristics.

For this purpose the implementation and sharing of a business dictionary that formalizes the definitions of business terminologies will provide a reference to the various stakeholders by stabilizing and clarifying the terminology of the business. This dictionary must obviously be incremented and kept constantly up to date in order to remove potential ambiguities and misinterpretations. The main difficulty in this exercise is building consensus in defining terms that are not used consistently across the bank. This presence of ambiguity is particularly present in the financial sector in general (eg the valuation of unlisted financial assets largely depends on the valuation method used, the distinction between what can be recognized as an expense or as an investment is sometimes blurred, the distinction between own account and third party account must be clearly explained, etc.).

Correctly implemented, the dictionary is a precious asset in the construction of the business model; the terms in question can appear in the different diagrams, in order to link the elements of models to the definitions to which they refer. Within the framework of CBT programs, it is recommended to structure in several areas for example by objectives / trades. [BJ] [illustration - Cf Appendix "Business dictionary - example"]

Goals / Business services Diagram The purpose of this diagram is to present the services of the bank which contribute (and will contribute) to the satisfaction of the determined objectives. Services are associated with strategic or operational objectives as well as associated measures, in order to allow companies to understand which services contribute to which aspects of business performance. It also provides a strong indication of the performance indicators for a given service.

Business service is a service provided to customers (internal or external). Business services are attached to business functions, with delimited boundaries and explicit governance. For example, a "loan's interest rate" function which describes the capacity of

bank to determine the interest rate linked to specific loans can be associated with more specific services such as: evaluate solvency of the client, collect information, get the basic rate of the moment, etc. Business services A business service will be associated with the business entities that it handles on entry and exit. This diagram is very useful in order to focus the bank's analysis on the services potentially impacted by the transformation program [BJ] [illustration - Cf Appendix "Goals / Business services Diagram - example"]

Business Use Cases diagram Use cases are a system description technique that privileges the point of view of users. It is a specific way of representing the system composed of a set of actions triggered by an actor who produces an identifiable result. The use cases prove to be very interesting for the preliminary phases of the CBT program in order to describe the existing and allow to deepen the identification of needs [BU]. Furthermore, this model has the advantage of not requiring any particular training and can therefore easily be adopted by the various stakeholders of the bank. This model will guide the collection of information during meetings between stakeholders. Each diagram can group different cases according to the selected criterion. In our case, a proposal would be to segment the analysis by service identified during the modelling of the "Goals / Business services Diagram". Then, depending on the size of the service in question and the most suitable representation, the diagram can represent the use cases of the service or the latter can be divided into sub-services.

Business Process Diagram The banking business processes will undoubtedly be impacted by CBT programs (automation of certain tasks, flexibility in the generation of products and services, etc.). A precise and up-to-date mapping of business processes allows the bank to define the priorities relating to the processes to be reformed or optimized. They identify the critical areas consider the processes impacted by the new objectives and can lead to more detailed studies of certain processes. For example, this will identify some of the processes that are currently being done through business and the use of independent applications that could potentially be supported by the new CORE Banking system. One of the teams that could benefit enormously from this automation is certainly the "Regulatory" team, the generation of a lot of financial reporting can be directly generated from the new CBS.

6.4 Information systems architecture

6.4.1 Introduction

While the business architecture focused on the organization and operation of the bank, the application analysis will allow the identification of IS components and their interactions so as to support the expectations of the business architecture, while ensuring overall coherence and respecting the rules of an architectural framework. From Information System point of view, modification of CBS has the following objectives [BQ]:

- Reduce legacy IT systems' maintenance costs

- Eliminate manual operations
- Build multi-channel capabilities

The description of the information system aims at representing the functioning of the bank as well as its organization in terms of the information to manage. In the context of a CBT program, bank generally deal with a vast information system with a high number of types of information as well as a high number of actors with different roles. It is therefore recommended to design the IS in a modular way in order to better understand it, control its development and allow, partial developments without impact on the rest. It is therefore recommended to "split" the system into an almost autonomous and reasonably sized subset called the domain. A domain is a part of the activity of the company, sufficiently coherent from an informational point of view to be able to be studied and represented by models. A domain represents a profession (i.e. a mission, a know-how and skills). As example, the domain can be for the bank, the management of loans. To perform this division, the bank can rely on the "Goals / Business services diagram" that will provide a first division for each defined goals.

In each domains it is necessary to identify the logical groups of capabilities that manage the data, support the business functions, and that interact with other logical groups or users (at this stage there is no question of determining the technologies used)[BJ]. During this analysis, banks will have to decide, for each application whether to keep it, to replace it or to modify it. As an example, the new CORE banking systems generally offer functionalities to automate some reporting. Legacy applications that were in charge of such functionality could thus be decommissioned in order to reduce maintenance costs. Obviously, some applications could be present in more than one service and communication between services is thus very important to ensure that decision to decommission the application is not taken by one without the validation of the other.

To decrease to probability of such risk, it is thus recommend for such project to implement a centralised matrix with all applications in one axis and all identified services in the other. In each cases, it should be indicated whether the application is used by the service. In the case where multiple services are using the same application, decision to keep or not the specific application should be discussed and communicated to all involved services' stakeholders.

In order to carry out this analysis, the bank must therefore have a clear, precise and as exhaustive as possible vision of the applications consuming data from the initial System. This necessity poses the problem of Shadow IT!

6.4.2 The importance of Shadow IT analysis

Shadow IT is a generic term used to describe all hardware, software or other solutions used by employees of a company without official IT approval. It includes macro excel,

non-validated software, cloud solutions, etc. Management of shadow IT represents a complex situation which must be taken into account by all companies as it exposes them to many potential risks such as compliance issues, wasted time, inconsistent business logic, increased risks for data loss or leaks, wasted investment, etc.

According to several studies led by Gartner or Everest Group, shadow IT could represent up to 50% (and sometimes more) of corporate IT [BR]. This explosion of importance linked to Shadow IT was born from the complexity of obtaining the technologies necessary for business by IT and by the inability for IT to respond to Business demand in a sufficiently rapid or precise way. At the same time, the democratization of IT and the rise of cloud computing have also strongly boosted this trend [BS]. Three major trends are emerging from Shadow IT: the use of Excel to replace dedicated applications, the development of Cloud Computing and the generalization of the BYOD (Bring your own device) trend. The use of Excel to replace dedicated applications is therefore still the strongest trend. It is explained by the fact that business services sometimes find it difficult to identify software or an application that can perfectly meet their needs. Using Excel and creating macros therefore seems the easiest solution to quickly and precisely respond to a need. [BT]

This situation is such that it can no longer be ignored by companies. All the more so that, properly managed, Shadow IT bring companies with an increase in productivity by allowing business to use the most suitable technologies to their needs without having to wait for IT approval while allowing IT to focus on other, more important tasks. Indeed, according to a survey carried out in France, 75% of the CIOs say that Shadow IT is profitable for the company, offering business teams the flexibility they need [BT].

The main problem therefore does not lie in the use of Shadow IT rather than in its management. Wrongly managed, it can lead to security issues, IT breaches, or alignment with regulations. According to Gartner, by 2020, a third of successful cyberattacks against businesses will target their Shadow IT resources. In addition, used without the consent of the IT department, certain technologies can be disabling for other employees, for example by affecting the bandwidth of the company. Finally, this practice can create data silos and prevent information from flowing freely within the enterprise. [BS]

In addition, modification of a CBS within a bank raises another risk at least as important as those previously mentioned: Operational risk! Indeed, the financial sector being particularly impacted by government decisions and the economic situation in general, the business must regularly use / develop applications without necessarily having IT approval. The use of VBA macro is, for example, particularly present in the context of financial reporting, etc. A CBT program will certainly have an impact on a large number of these applications via, in particular, modification of the data sources. In addition, while applications referenced by the IT can sometimes lack documentation, the Shadow IT applications are generally not, or very little, documented which thus make

it very difficult to have a precise impact assessment on them and therefore on business operations. Considerable resources must therefore be put in place by the bank in order to:

- List Shadow IT applications as comprehensively as possible
- Determine the inputs necessary for the proper functioning of the applications
- Clearly define the expected output as well as the use that will be made of it (what information is obtained, what is it used for, how often is this output necessary, etc.)
- List the applications impacted by the CBT program and estimate impacts it has:
  - On the application
  - On the business process
- Inform the business about the risks linked to the misuse of shadow IT, its repercussions on the company, its limits, etc.

In addition, shadow IT analysis are a very useful source of information to determine the needs of the profession by showing more or less clearly the most used views, the necessary level of information, etc. Once processed, this information greatly enriches the program requirements definition.

The author recommends, in general, the implementation of a team within the bank, which would be dedicated to:

- Shadow IT documentation
- Training the business on risks, best practices, limits linked to shadow IT
- Highlighting the most recurrent "problems" solved through the use of shadow IT and their communication to the IT team to enhance viable IT solution for them.

6.4.3 Some useful artefacts

Communication diagram It makes it possible to highlight the interactions between the various objects of the studied system. Within the framework of the analysis, it will be used on the one hand to specify the context in which each object evolves and on the other hand, to highlight the dependence between the various objects involved in the execution of a process or a use case. It therefore makes it possible to reveal the interactions between objects and the messages they exchange [BU]. As part of the CORE banking system transformation program, the analysis and modelling of interactions between objects (application, interfaces, etc.) must be carried out at two levels:

- At the level of each business service in order to show the exchange of information which is currently necessary in the realization of the various services previously identified. This will highlight potential dependencies or inefficiencies that

will define certain improvements for the target architecture (e.g. same information accessed in two different places, data processed to extract information while it is directly available elsewhere , etc.)

- At the CBS level, you should have an exhaustive view of the messages exchanged as well as of the objects that interfere with the CBS. This analysis will highlight the potential forgotten in the initial scope. So if an application exchanges with the CBS but is not included in the analysis of any identified system, the bank will have to conduct an in-depth investigation to determine the usefulness of the application, its importance, etc. which could eventually lead to a modification of the scope

6.5 Technical architecture

6.5.1 Introduction

The technical architecture establishes the physical and technical correspondence with the elements developed during the previous architectural phases. It provides a more concrete view of the way in which the application components will be produced and deployed and makes it possible to highlight the problems of migration between stages of the trajectory defined by the evolutions of the Information Systems. It provides more precise means for assessing the responses to constraints relating to the Information Systems, in particular by estimating the hardware and network sizing needs, or by highlighting redundancy of servers or storage. In addition, it makes it possible to ensure that the application components defined in the previous step work together, once assembled

The complexity and size of CORE Banking System projects requires the implementation of one or more technical architects within banks to ensure the overall integrity and critical characteristics of systems and development processes. These will be responsible in

- Allow the implementation of sustainable systems architectures
- Promote independence vis-à-vis API / framework providers
- Promote the appropriate technologies to meet functional requirements

The software architect is responsible for creating / selecting the most appropriate building blocks for the system to meet business needs and defined functional requirements while respecting set constraints.

The main objective of the technical architecture will therefore be to ensure that the physical components meet the non-functional requirements such as:

- The performance
- Regulatory compliance

- Security
- Protection of personal data
- Reliability
- Possibility of recovery
- Etc.

6.5.2 Some useful artefacts

Hardware and computer network diagram Among the diagrams used in the analysis of technical architecture, the "hardware and computer network diagram" plays a central role in modelling the deployment of application components of all types in a distributed technical architecture(Most of other diagrams being derivatives of this one focusing on specific views / aspects). [BJ] It allows you to have a snapshot of the distribution of the IT infrastructures hosting the application components and of the accesses provided to the different users. (Illustration of this diagram is presented in the Annexes)

7 Work Breakdown Structure and identification of the critical path : realization of the road from baseline to target

Once the outline of the future Core Banking system has been defined, the bank therefore has a clearer vision of the target structure and its initial structure: a high-level vision of GAP is therefore identified. Now, it is necessary to refine the tasks and different deliverables to be provided in order to pass from the AS-IS situation to the TO-BE situation. To do this, the implementation of a Work Break-Downs Structure (WBS) is generally recommended. The WBS can be defined as: *"hierarchical decomposition of the total scope of work to be carried out by the project team to accomplish the project objectives and create the required deliverables."*[BW]. The WBS will therefore offer a tree structure ranging from defined projects to concrete tasks. In this context, the deliverable can be defined by the accomplishment of a defined activity, the delivery of an object / functionality, etc. Focusing on the deliverables rather than the method allow the optimisation of the work necessary to achieve the defined goal. [BW]

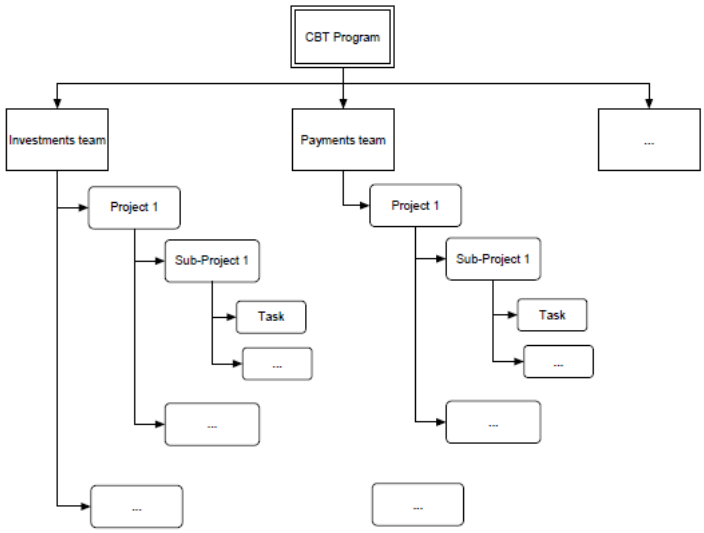
7.1 Decomposition of the scope : from projects to tasks

Setting up a WBS is complex work and requires constant monitoring. Indeed, being in particular very dependent on requirements, it risks evolving during the project to materialize more and more. However, it seems important to invest time and money in this work, especially in the context of a program as complex as a CBT. Indeed, fully implemented, a WBS allows to break down the complexity of the program and offers the following advantages [BW]:

- Defines specific and measurable deliverables
- Divide work into manageable chunks
- Allows refinement of cost estimates, necessary capacity and other investments necessary to achieve the various deliverables. (and therefore the program in general)
- Minimizes the risk of going outside the defined scope, or, on the contrary, of forgetting elements of the scope
- Avoids unnecessary work (duplicates, etc.)
- Once implemented with effective dependency management [see next section] the WBS greatly facilitates the implementation of an optimal schedule
- Optimizes the monitoring of project progress and quickly takes the necessary measures

The level of detail provided by the implementation of a quality WBS is therefore a powerful tool that will help project managers, both to refine their estimates and to

optimize the monitoring of the evolution of the program down to a level of sufficient granularity to provide a consistent view.



Best Practices in defining the Work Break-down Structure :

When defining the deliverables, it is advisable to focus on the definition of these, avoiding thinking about how to achieve them. Focus on results not on Action! Indeed, if the deliverable is correctly defined, the experts in charge of it will be better able to define the optimal way to achieve them.

Ensure that the projects / tasks / deliverables do not overlap. Each definition of deliverable must meet a specific objective that is distinct from other definitions in order to ensure that there is no duplication of work to be implemented. On the other hand, the presence of duplicates would undoubtedly create confusion as to the responsibility for accomplishing certain objectives. To do this, it is advisable to regularly organize meetings between the different project managers (determined in subsection 4.4 Objectives definition: Cardinals points of the project). During these meetings, each of them will present the various deliverables defined as well as their goals to ensure that these have not been supported by another team. (example: certain deliverables defined within the framework of the application of the MIFID II regulation could have been defined by both the "Investments" team and the "Regulatory" team). As soon as a duplicate is identified, it is necessary to quickly determine:

- The cause of this duplication (rule of definition of unclear responsibilities, poor understanding of a specific scope, etc.)
- The rules to be put in place in order to clarify responsibility for the deliverable in order to

1. Solve the case in question
2. Avoid a new overlap

Conversely, make sure that the entire scope is taken into account (and no more). To do this, the author recommends inserting an attribute for each deliverable / sub-project / project identified. In this attribute, the different Objective Owners will have to list the identifiers of the requirements to which these deliverables / sub-projects / projects meet and determine whether their achievement partially or totally meets the identified requirements. Thus, once an iteration of the WBS is finalized, a check can be carried out to ensure:

- That all validated requirements have been taken into account and that they will be fully taken into account
- That the deliverables which are not associated with any defined requirement are indeed necessary and are not outside the defined scope.

Otherwise, given the complexity of the program, it is obvious that some deliverables will not yet be known. For the latter, it is recommended to enter as much information as available during the current iteration, then update the document as you learn more, during the following iterations

Finally, it is necessary to go down to a sufficiently fine level of granularity so that the task monitoring as well as the estimates are precise enough while not being too fine so that the deliverable is still understandable. In general, the literature recommends having a final granularity whose workload is between 1 and 10 Man Days (MDs) [BW]. In view of the size of the CBT projects, the author estimates that this recommendation can be relaxed to around 20-30 MDs for deliverables whose implementation should start at least one year after the iteration that generated the WBS.

Bellow table provide an example of information to be collected for on of the projects of Investment team :

Program	Team	Project	Sub-Project	Task ID	Tasks	Estimated Workload (Mds)	Additional Investment (EUR)	Requirements ID	Fully / Partially	Comment
CBT Program	Investment	Invesment platform development	Define the possible profile of Customer	Inv-1-1-1	List potential profile and their characteristics	2,00	0 EUR	RE_INV1 RE_REG32 RE_ASS43	Partially Partially Partially	
				Inv-1-1-2	Implement the process to determine type of profile	6,00	0 EUR			
				Inv-1-1-3	Create different profile in the Investment platform	8,00	0 EUR			
			Assess the risk of each product	Inv-1-2-1	Define process to identify the type of each product	1,00	0 EUR			
				Inv-1-2-2	Define process to identify the rating of each product	1.5	0 EUR			
				Inv-1-2-3	Implement process to define risk linked to each product	6,00	5000 EUR			Need to extend Bloomberg licence
			Adapt Communication/Warning depending on the profile	Inv-1-3-1	Define rules to send appropriate communication to appropriate receiver	2,00	0 EUR			
				Inv-1-3-2	Create automated communication	5,00	0 EUR			
			...	...	...	...	...	...	...	...
		...	...	...	...	...	...	...	...	...
	...	...	...	...	...	...	...	...	...	...

7.2 Dependencies management : unavoidable step for efficient planning

In programs as complex as CBTs, a large part of the tasks are subject to many dependencies. These can be for a variety of reasons, whether it's waiting for another task to exit or waiting for resources to be released. Throughout the development of the program, it is therefore necessary to manage these dependencies in order to ensure the success of the project within the framework of the constraints set (timing, costs, etc.). Although often very complicated to set up, optimal dependency management provides many advantages in the execution of the program [BX] [BY]:

- Anticipation of possible hazards and implementation of necessary actions in order to mitigate the consequences thereof. (eg delay in executing a task could cause delays in launching a series of other tasks and thus block resources unnecessarily. The bank could therefore decide to allocate more resources to ensure that the task finishes on time or start other independent tasks).
- Determine the order in which the actions are planned in order to ensure optimal delivery. (e.g. if the Regulatory team requires the delivery of a component of the Invest team, this task must obviously be planned later than the one allowing the delivery of the component in question).
- Refine the precision of the scope of each project while increasing an overview of the program
- Optimizing the capacity management of resources by offering a view of their availability (eg if a task cannot start because the necessary component has not been delivered, the "released" resources can be allocated in support to other tasks to mitigate the risk of further discrepancies.)
- Increase the flexibility of the projects by allowing to quickly see the potential impacts of a replanning and thus optimize it
- In addition, the active management of dependencies makes it possible to ensure that the scope taken into account by the different projects is indeed complete and, conversely, that it is not "duplicated" in different projects (ie avoid Duplicates)

As with requirements engineering, dependency management is an iterative process that must be managed throughout the project. This management can be divided into 3 main steps: Identification of potential dependencies, validation of dependencies and follow-up of dependencies.

To do this, it is recommended to schedule regular meetings between the different project-owners and other relevant stakeholders in order to present their projects / subprojects / tasks and the evolutions that they may possibly undergo. During these projects the various stakeholders raise the various questions in order to clarify as much as possible the expectations and objectives of each. These meetings must obviously be more frequent

for projects with goals that have already been identified as highly dependent (cf "Goal Definitions: Destination of the project"). At the end of these meetings the stakeholders should have:

1. Listed / refined potential dependencies
2. Defined clear actions for the appropriate project managers to discuss after the meeting

Once listed, dependencies should be examined and cleaned up to ensure that they are focused on the ones that are most relevant and not overwhelmed by a flood of unusable information. Project managers must then work on either side of a dependency to validate it and ensure that the dates are realistic and achievable. Otherwise, one of the projects will probably have to be redesigned. The aim is for all parties to agree on the delivery date and for it to be realistic.

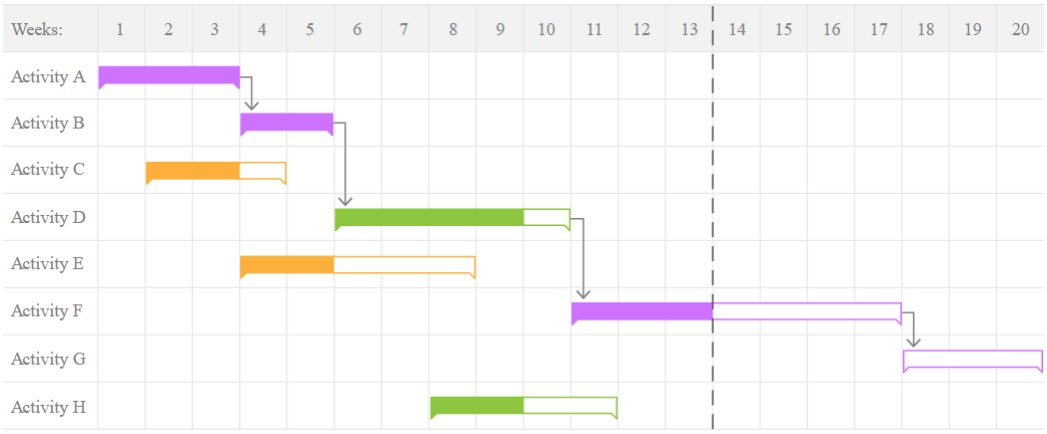
Finally, it will be necessary to follow the evolution of these dependencies in order to confirm the good progress of the project and to take the necessary actions to minimize the potential impacts in the event that these dependencies are not respected. To do so, a risk indicator must be regularly updated to ensure that it is informed early enough of a potential incident. To do so, the PMO will generally be asked to monitor progress against these critical milestones through regular meetings and reports. When a milestone seems to slip, they must then determine the likelihood of it being missed and assess the impact and mitigation actions through follow-up meetings with the recipient project [BZ]

In order to manage dependencies optimally, it is generally recommended that they be listed in a centralized registry that can be viewed by relevant stakeholders. To do this, the following attributes are often needed:

- Dependency ID
- ID / name of the dependent Project
- Dependent Task ID - details of the milestone / task requiring delivery
- ID / name of the Projects on which the team depends
- ID of the task on which the team depends
- Type of dependency - As explained previously there are 4 types of dependencies: Start - Finish, Finish - Start, Start - Start, Finish - Finish (see section "Objectives definition: Cardinals points of the project")
- Description of dependency
- Delivery date - Date on which it is estimated that the dependency must be closed so as not to impact the project

- Likelihood - probability that the addiction will not be satisfied within the required time frame
- Impact - impact of dependency not delivered on time (capacity, budget, deadlines, etc.)
- Status - In the process of validation, validated, cancelled, closed, etc.
- Owner - who owns the dependency
- Release date - date on which the dependency was raised
- Comments

Once the dependencies have been validated by the various project owners and the mitigation actions have also been triggered, management must therefore be able to have a first high-level view of the overall planning of the program. This high level view will generally be represented via a Gantt chart. The latter will provide a vision of the sequence of tasks, provide the deadline for each key task, optimize resource management, view all the tasks to be taken into account, etc. [BB]



Once this baseline has been defined, the project managers will be able to control the progress of the project, ensuring that it is "under control" and quickly take the necessary decisions / actions if the project tends to deviate from defined set of objectives / constraints.

8 Conclusion

Although often necessary in order to grow in the banking industry, CORE Banking systems update programs continue to scare banks. These are in fact part of the riskiest, most expensive and longest projects that banks have been faced with. To carry out these kinds of programs, banks must therefore invest considerable resources throughout the project to ensure the smooth running of the program. Once the main objectives have been determined, it is recommended to divide the program into a set of less complex projects in order to facilitate management.

Subsequently, the definition and validation of the requirements will make it possible to define the main functionalities that the target system must have. Requirements engineering is a complex and iterative process that requires significant investment throughout the project. Indeed, errors in it can generate considerable costs which can go as far as compromising the success of the program. In order to minimize the risk of error, it is recommended to negotiate the requirements with all the relevant stakeholders in order to obtain a mutual consensus (Win-Win condition).

Once the functionalities have been defined, it is necessary to analyse the current situation of the bank, define the situation that the bank wishes to have at the end of the program and identify the gap between the AS-IS situation and the TO-BE situation. In order to be as exhaustive as possible, this analysis must be carried out via three inter-dependent "points of view":

- The business architecture, defining the main business processes allowing the bank to achieve its objectives
- The information system architecture, which highlights the various exchanges of data and information between the applications / actors of the bank which make it possible to support the business in achieving its objectives
- The technical architecture which establishes the physical and technical correspondence with the elements developed during the previous architectural phases. It gives a more concrete vision of the way in which application components will be produced and deployed and makes it possible to highlight the migration problems between the stages of the trajectory defined by the evolutions of Information Systems.

Once the gap has been identified between the baseline and the target, it should be broken down into a set of phases and then tasks grouped together in a centralized document: The Work Breakdown Structure. We reiterate the importance of communicating the breakdown between the different projects of the program in order to ensure both the completeness of the scope and the absence of duplication between the different projects.

The next step in defining the program roadmap involves defining and managing dependencies, both within each project and between different projects. Good dependency management offers many advantages for program management: anticipating and mitigating possible risks, optimizing the order of execution of the various defined tasks, offering optimal resource management to managers, bringing flexibility to the program, etc. Once again, communication is essential to successfully complete this step. It is therefore recommended to schedule regular meetings between the different programs to ensure the proper understanding and proper management of the defined dependencies.

The reader should be reminded that the different phases described in this thesis are generally iterative and that the outputs defined in each of them should not be considered fixed and final. Indeed, during the evolution of the program, many events can arise and disrupt the defined priorities, the scope, etc. In addition, the complexity of CBT programs make the "landscape" rather vague and require the definition of many assumptions which can evolve or turn out to be false.

9 Annexes

9.1 Stakeholders register - example

Name	Int. / Ext.	Stakeholder Role	Power (H/M/L)	Interest (H/M/L)	Stakeholder's interest	Stakeholder's worries	Contacts	Comments
Name 1	Int.	Sponsors	H	H	Increase revenue Decrease maintenance cost Boost innovation	Failure of programme	Mail : xxx@yyy.com Tel : +32/499 xxxxxx	
Name 2	Int.	Regulatory team	M	H	Ensure Bank is compliant with defined regulations	Systems / operations not compliants with regulations	Mail : xxx@yyy.com Tel : +32/499 xxxxxx	
Name 3	Ext.	QA team	H	L	Ensure Best Practices are used in program management and delivery		Mail : xxx@yyy.com Tel : +32/499 xxxxxx	Advised to contact him by phone or by using its external mail adress
Name 4	Ext.	PMO	M	M	Program to be delivered on time within defined budget.		Mail : xxx@yyy.com Tel : +32/499 xxxxxx	

9.2 Capabilities / skills Matrix - example

Employee Name	Role	Security	Software Development	Data Management	Infrastructure	Network Management	Asset Management	Storage Management	Programming Language	Microsoft Office Suite	Testing	Management	Leadership	Stakeholder Management	Governance	Written Communication	Oral Communication	Presentation
John Wilson	Business Analyst	0	0	0	0	0	0	0	2	3	0	2	1	3	0	4	3	3
Donald Lee	Business Analyst	0	2	1	0	0	2	0	3	4	1	3	4	4	0	4	4	4
Suzie Arthur	Developer	0	4	0	1	2	1	2	4	3	2	3	4	3	1	2	2	0
James Scott	Developer	1	4	1	1	0	0	0	4	3	1	1	3	2	2	3	3	2
Joanne Downs	Developer	0	3	1	0	2	2	0	4	2	2	2	2	3	0	2	2	3
Hayley Johnson	Developer	2	2	2	1	1	2	1	3	4	2	3	2	2	2	4	3	1
Alex Dunstan	Developer	1	2	1	0	3	1	3	3	2	1	1	1	0	1	2	2	1

Illustration from "Techno - PM : Project Manager Templates" [CB]

9.3 Constraint / Assumptions log template - example

Assumptions / Constraints Log								
ID	Category (Scope, Planning, Resources, Regulatory, Other	Constraint / Assumption description	Owner	Due Date	Evolution follow-up (On track, At risk, Issue)	Action taken	Status (Not Started, Ongoing, Closed, Cancelled)	Comments
AC-002	Planning	The new CBT should be implemented by end of 2023	Sponsors	31/12/23	On track	Regular reporting with teams	Ongoing	
AC-001	Scope / Regulatory	New CBS will integrate regulations evolutions	Regulatory team	31/12/23	At risk	Regular follow up meeting with provider	Ongoing	Meeting planned on XX/XX/2020 with provider and regular expert to be alligned
AC-003	Resources	xxK Man Days have been allocated for testing	Testing teams	31/12/22	On track	Need to identify vendor specialised in testing to support teams	To be started	

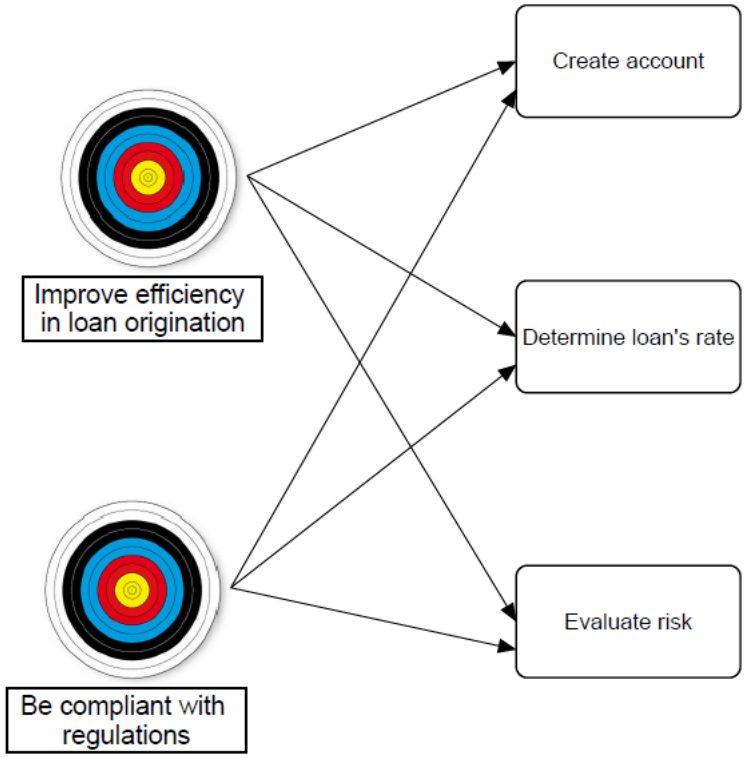
Log inspired from "Techno - PM : Project Manager Templates" [CC]

9.4 Business dictionary - example

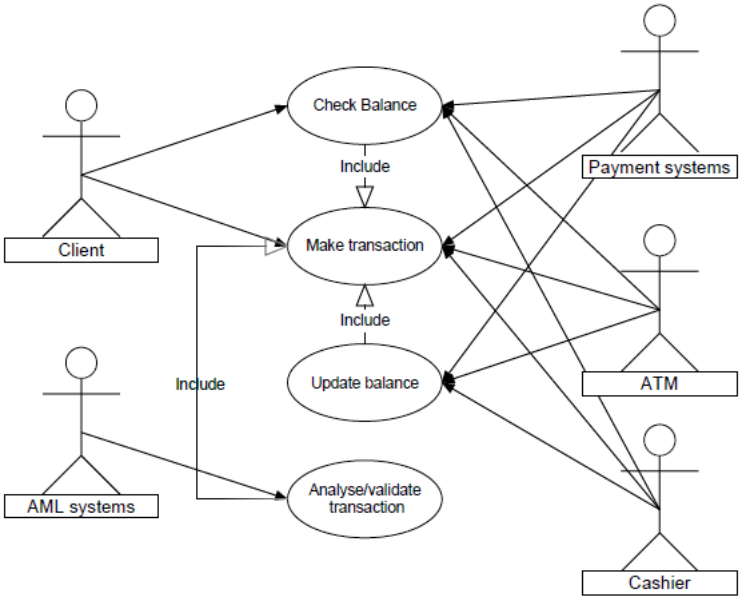
Team	Business Term	Potential accronyms	Business Definition
Investment	Bonds		*« Fixed income instrument that represents a loan made by an investor to a borrower »*
	Derivative		*« Financial security with a value that is reliant upon or derived from, an underlying asset or group of assets—a benchmark. »*
	Foreign Exchange	FX / FOREX	*Marketplace where various national currencies are traded.*
	...		...
...	...		...

All definitions have been found on *www.investopedia.com*

9.5 Goals / Business services Diagram - example



9.6 Business Use Case - example



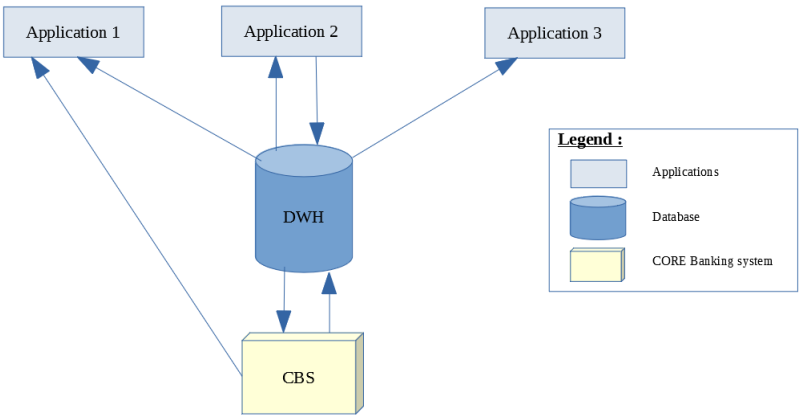
Make transaction
Actor : • Client • Cahier • ATM • Payment systems
Objectives : Transfer defined amount of assets from customer's account to other defined account
Description : • Main Scenario : Possibility to move assets from customer's account to other defined account once validated by systems

Check Balance
Actors : • Client • Cashier • ATM • Payment systems
Objectives : Check whether the client has sufficient assets to perform the transaction
Description : • Main Scenario : Everytime client launchs a transaction, system should ensure that the client has sufficient assets • Secondary scenario : Whenever the clients want to have an overview of its balance he should be able to get the information by connecting to its account or by asking to cashier/ATM

Update balance
Actors : • Cahier • ATM • Payment systems
Objectives : Once the transaction has been validated and executed, client's balance should be updated
Description : • Main Scenario : Client's accout should be updated following executed transactions to reflect the new balance

Analyse/Validate transaction
Actors : • AML systems
Objectives : Ensure the transaction is compliant with AML rules and block it if it is not the case
Description : • Main Scenario : Whenever a transaction request is received, AML systems should launch some processes to ensure the transaction is compliant with AML rules. If it is the case the transaction is validated while if not, then the transaction should be blocked

9.7 Communication diagram - example



9.8 Hardware and computer network diagram - example

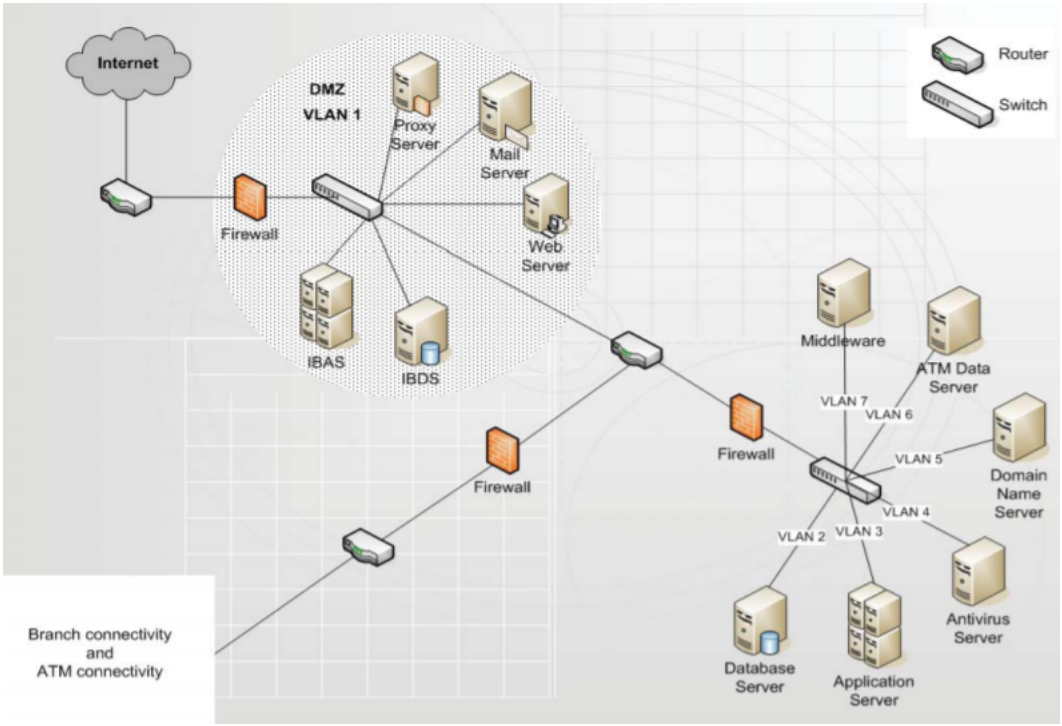


Illustration from "Unit – 4: Core Banking Solution" [CD]

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